

ASSESSMENT FOR NATIONAL PARK CANDIDATE AREA USING MULTI-CRITERIA DECISION ANALYSIS

A case study from the Argyll Islands and Coast

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**A dissertation presented for the degree of Master of Science
University of Edinburgh, 2007.**

THE UNIVERSITY OF EDINBURGH

ABSTRACT OF THESIS

(Regulation 3.5.13)

Name of Candidate **CHRISTINA GAROUFALIA***Address**Degree* **MSc Environmental Sustainability** *Date* **24/08/2007***Title of Thesis* **Assessment for National Park candidate area using Multi-Criteria Decision Analysis***No. of words in the main text of Thesis* **18604**

This thesis outlines an assessment approach for national park designation purpose using Multi-Criteria Decision Analysis. The case study area is 'Argyll Islands and Coast' situated in west Scotland. Four different management options are explored and six criteria are identified. The objectives of the analysis are 'Ecosystem services' and 'Viable local communities'. The approach is an illustrative example of how these options can be compared and focuses on the viability of local communities. Scoring of the criteria is realised with the 'relative preference scales' method while weighting of the criteria is realised with the 'swing' method. The lack of quantitative data results in uncertainties related to scores and weights' assignment. Moreover, due to time constraint stakeholder participation is not included in the MCDA process. To offset the two latter issues and increase the knowledge on the characteristics and activities taking place in the area, five interviews are carried out. The interviewees are chosen according to their background so that some of the major stakeholder groups are represented in the MCDA. The triangulation method is used to integrate the qualitative data derived from the interviews in the sensitivity analysis. The results indicate the need for more quantitative data to reduce uncertainties and for options which improve the performance on the major criteria.

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1 Introduction

The aim of this first chapter is to introduce the reader to the scope of the current thesis and familiarize him with the aspect of National Marine Parks. In the beginning of this thesis about four months ago, Scotland was planning to have its first Coastal and Marine National Park by 2008. For this purpose, 10 areas along the Scottish coastline were designated as candidate sites. These ten sites are the following: 1. Moray Firth, 2. North Uist, Sound of Harris, Harris and South Lewis, 3. Orkney and Pentland Firth, 4. Shetland (including Fair Isle), 5. Solway, 6. Wester Ross and North Skye, 7. Argyll Islands and Coast, 8. Lochaber and South, Skye, 9. Clyde and 10. South Uist, Sound of Barra and Barra (Figure 1).

Scottish Natural Heritage carried out a three stage assessment to evaluate possible candidate areas, according to which Argyll Islands and Coast, and Ardnamurchan and Small Isles and the South Skye Coast were identified as possible strongest all round candidates for Scotland's first Coastal and Marine National Park (Scottish Executive, 2006). This thesis is about the assessment of the Argyll Islands and Coast for national park area contributing to the sustainability of local communities. The method used for this assessment is Multi-Criteria Decision Analysis.

1.1 Reasons for choosing this topic

Coastal and marine zones are worldwide characterized by competing uses and are important to different users for several purposes; fishing and aquaculture activities, transportation and navigation, tourism and recreation, infrastructure and renewables' development are only some of these. It is quite interesting and challenging how policy makers could balance and integrate all these uses taking into account all stakeholders and safeguarding simultaneously the coastal and marine environment. Another reason for

choosing this topic is the author's undergraduate background in "Marine Sciences" that enhanced her love and interest in the coastal and marine areas.

1.2 The (IUCN) definitions of National Park and Marine Protected Area (MPA)

1.2.1 The IUCN definition of a 'National Park'

According to the International Union for the Conservation of Nature and Natural Resources (IUCN), a National Park is a protected area managed mainly for ecosystem protection and tourism. In particular, a National Park is a natural area of land and/or sea, designated to

"(a). protect the ecological integrity of one or more ecosystems for present and future generations;
(b). exclude exploitation or occupation inimical to the purposes of designation of the area; and
(c). provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible" (IUCN, 1978: National Park).

It is obvious that the IUCN definition of National Park is mostly focused on the aspects of environment and recreation. Nevertheless, this is not always the case with National Parks. Sometimes, the designation of a site as a National Park can be seen as an opportunity of ensuring the viability of the local communities living in or by this site.

It is considered important to mention that there is no standard definition for a Coastal, Marine or both Coastal and Marine Park. The closest definition found in the literature could possibly be the one of a Marine Protected Area (MPA).

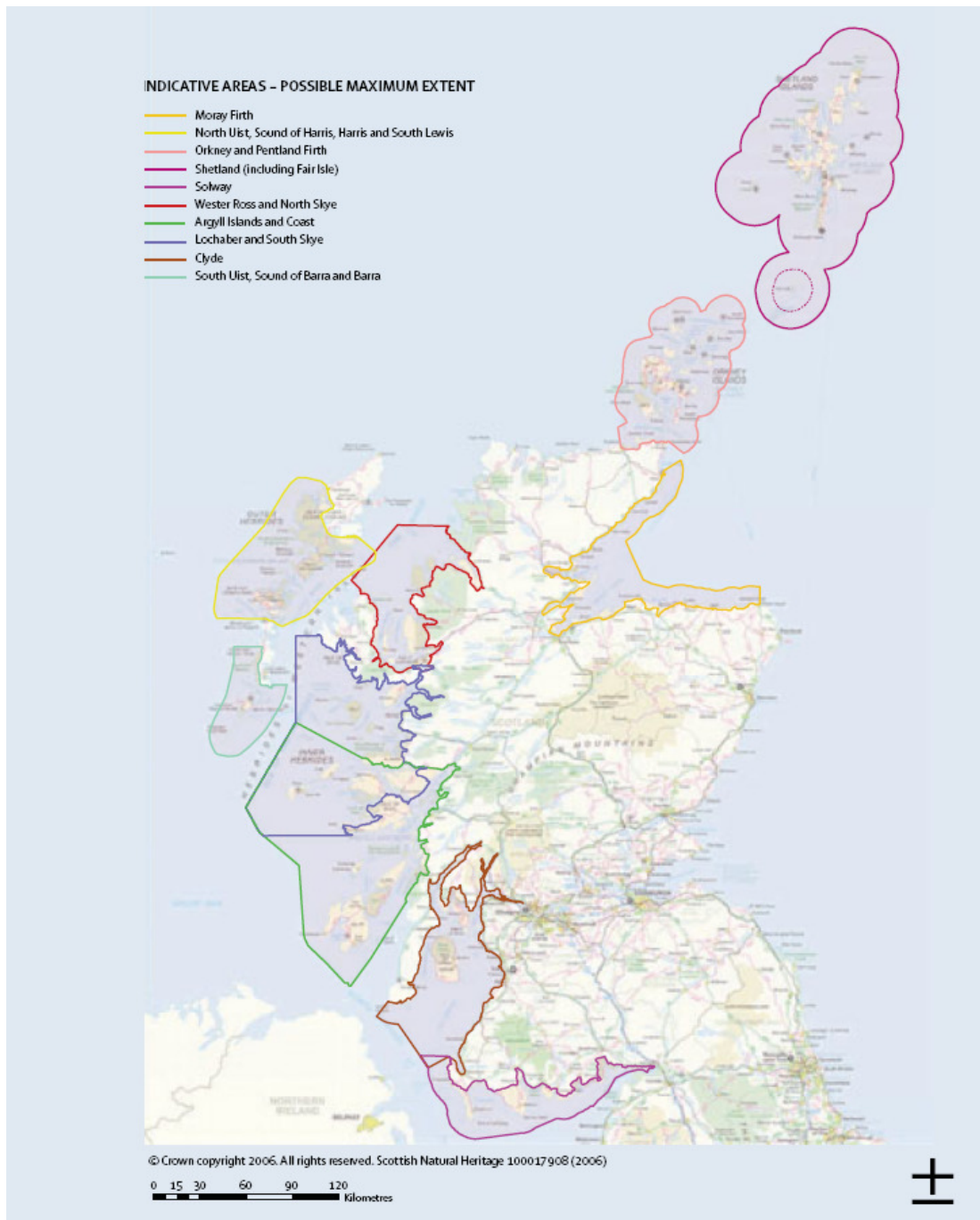


Figure 1. Overview map of ten areas
(source: Scottish Executive, 2006)

1.2.2 IUCN definition of an MPA

According to IUCN, an MPA is defined as “Any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment” (IUCN, 1988, 1994).

An integration of the two aforementioned definitions (National Park and Marine Protected Area) could probably produce the definition of a National Coastal and Marine Park. Given the fact that there is no standard definition for a Coastal and Marine Park, several difficulties arise. These difficulties are linked to the fact that there are no given restrictions in fishing, infrastructure and recreational activities. Therefore, these restrictions have to be defined for each case study area. Some case studies of Marine Parks around the world are presented below.

1.3 Marine Parks around the world

- **Australia – Great Barrier Reef case study** (Marine Parks Regulation, 2006)

The Great Barrier Reef Marine Park in Australia (Figure 2) is managed by the Marine Park Zoning Plan 2004. According to this document, the Marine Park consists of the following zones:

- (a). general use zone;
- (b). habitat protection zone;
- (c). estuarine conservation park zone;
- (d). conservation park zone;
- (e). buffer zone;
- (f). scientific research zone;

- (g). marine national park zone; and
- (h). preservation zone.

According to this distribution, fewer activities are allowed going from (a). general use zone to (h). preservation zone.



Figure 2. The Great Barrier Reef Marine Park
(source: Reefpix, 02/07/2007)

- **USA** (Marine Conservation Law, 1978)

USA has already 22 Marine Parks and 8 candidate sites for marine parks (Figure 3). The Marine Conservations Law (1978) makes a distinction among three categories of marine parks in order to define the restrictions that should be imposed; namely:

- (a). replenishment zones;
- (b). marine parks zones; and
- (c). environmental zones.

Again, more activities are prohibited going from (a). replenishment zones to (c). environmental zones.

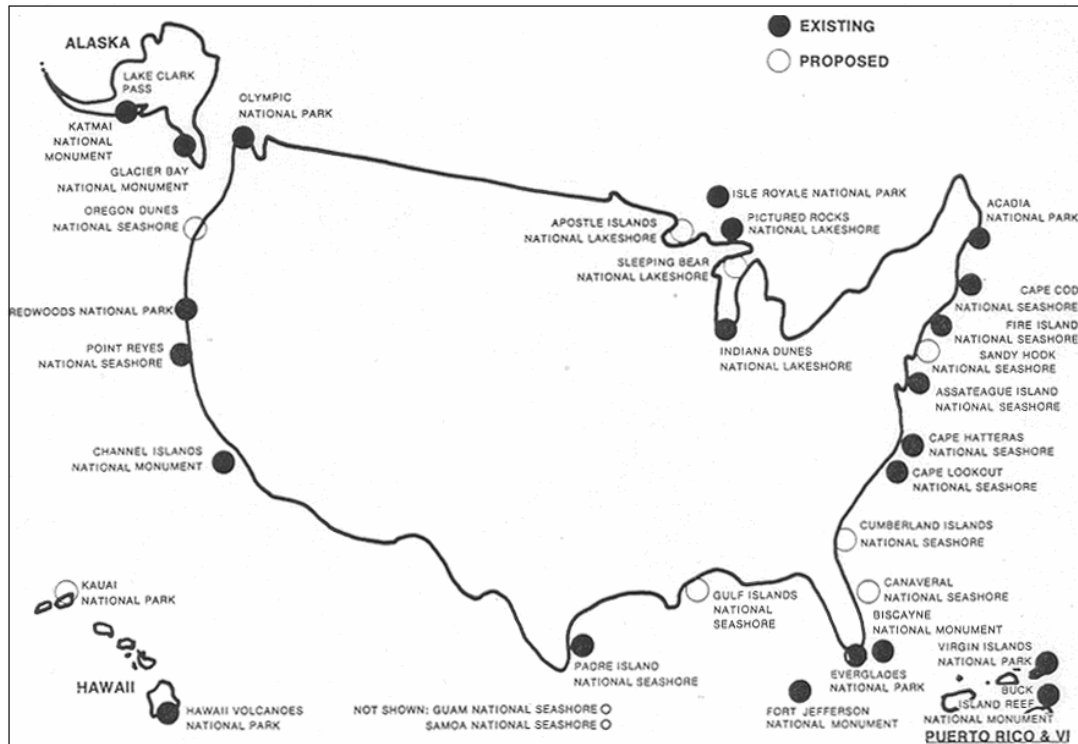


Figure 3. Marine Parks in the United States
(source: Bureau of Outdoor Recreation, 02/07/2007)

- **Greece – Zakynthos (Laganas Bay) case study**

Zakynthos is a refuge for the loggerhead turtle *Caretta caretta* in the Mediterranean. The aim for the National Marine Park's designation is to provide the appropriate nesting conditions for the turtle. The main restrictions include no access to the beach at night, beach furniture confined to a small portion on two beaches, no vehicles on the beaches and light regulations. Moreover, marine traffic and fishing have been regulated through zonation (Figure 4) since 1988 by separate Ministerial Decision. A particular significant measure was the declaration of privately owned land as natural reserves and its set aside for sea turtle conservation (Marine Turtle Newsletter, 2001).

Additionally, underwater fishing is forbidden within the Marine Park area (Find out about Zakynthos Marine Park, 02/07/2007).

Restrictions within the Laganas Bay Marine Park

Zone A: no boats are allowed;

Zone B: boats can navigate with a speed limit inferior to 6 miles per hour while anchoring is forbidden; and

Zone C: boats can navigate with a speed limit inferior to 6 miles per hour while anchoring is allowed (Figure 4). In the strictly protected area, the “Sekania beach”, the entrance is only allowed for researchers endowed with a special permission.

In the beaches where turtles spawn the following activities are forbidden:

- Entrance before sunrise and after the sunset;
- Use of sunshades beyond 5 meters from the seashore;
- Digging where there are turtles nests and in the dry sand;
- Touching the cages which are protecting the nests;
- Use of any vehicle (for example bicycles, motorbikes);
- Access to horses;
- Access to dogs without leash; and
- Use of torches or other lights at night.

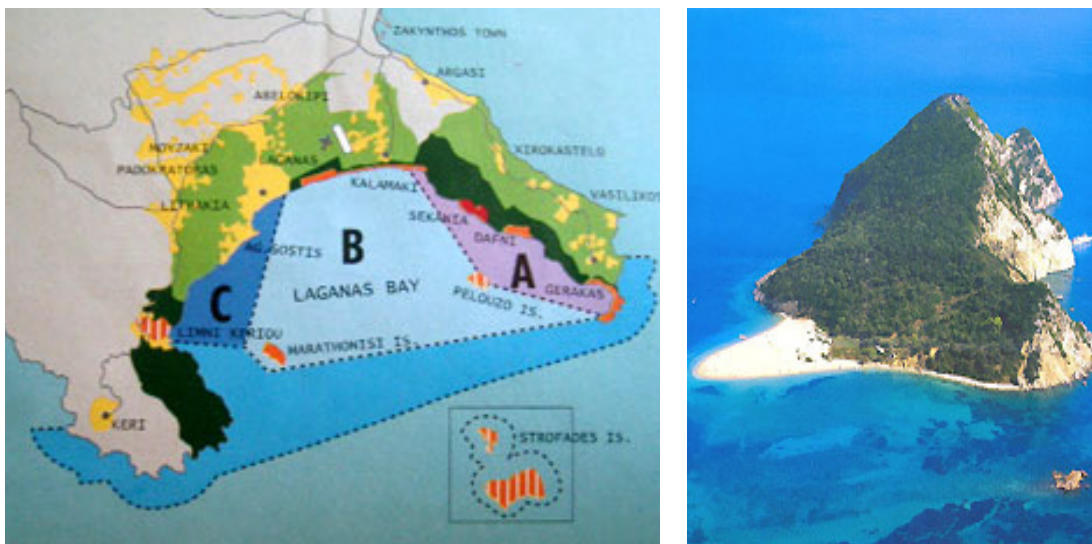


Figure 4. a. Laganas Bay Marine Park; b. Marathonisi (island included in the Marine Park area)
(source: a. Find out about Zakynthos Marine Park, 02/07/2007 and b. Zante.ws , 03/07/2007)

- **Jamaica – Montego Bay case study**

The mission statement of the Montego Bay Marine Park (MBMP) is “to restore and protect a healthy Montego Bay ecosystem for the betterment of Jamaica and the world” (Montego Bay Marine Park, 02/07/2007).

Several activities are prohibited within the boundaries (Figure 5) of the MBMP, such as mining, removal or damage of any plant or animal life, discharges of any kind of pollutants, and spear-fishing. Other activities, such as dredging, excavating and filling operations, building structures and carrying out research, need a written permission from the Montego Bay Park Authority.

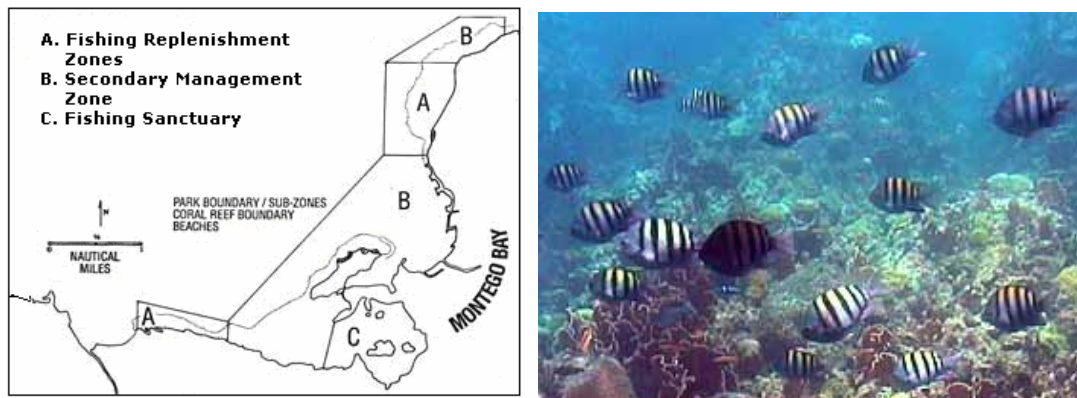


Figure 5. a. The Montego Bay Marine Park – The sub-zones (source: Montego Bay Marine Park, 02/07/2007); and b. Picture of the sea bed in the MBMP (source: Silver sands, 02/07/2007)

- **Thailand - Gulf of Thailand coast and Andaman Sea coast**

There are currently 26 Marine National Parks in Thailand, 21 of which are formally legalized, while five are in different stages of legalization; ‘Anthong National Marine Park’ (Figure 6) belongs in the former group of parks. According to existing legislation, fishing activities are prohibited within the Parks’ area. However, it is believed that, during enforcement, the system will be more ‘flexible’ allowing some types of fishing in parts of the designated area (National Park, Wildlife and Plant Conservation Department, 2000).



Figure 6. Angthong Marine National Park, Thailand
(source: Exploring Ang Thong Marine National Park, 03/07/2007)

To sum up, it is obvious that there is no standard definition or restrictions for Marine Park. The main reason for their designation is environmental conservation and recreational purposes. In the current case study the it is explored how the National Park can contribute to the viability of the communities and the restrictions imposed are clearly defined in advance.

2 Scotland

The aim of this chapter is to describe Scotland's background on National Parks and state in brief Scotland's geographical and environmental characteristics.

2.1 Scotland's background in National Parks

Scotland has so far two National Parks; the Loch Lomond and Trossachs National Park and the Cairngorms National Park.

- **The Loch Lomond and Trossachs National Park**

The Loch Lomond and Trossachs National Park (Figure 7) became fully operational on the 19th of July 2002 and was officially opened by Princess Anne on the 24th of July 2002. There are rivers and larger lochs, with numerous smaller lochs and lochans included in the Park area. The aforementioned National Park embodies a limited area of the intertidal zone but it does not contain "marine elements below low water mark" (Scottish Executive, 2006).



Figure 7. Loch Lomond
(source: Loch Lomond & The Trossachs National Park, 12/07/2007)

- **The Cairngorms National Park**

The Cairngorms was declared a National Park in September 2003 because of its important wildlife (Figure 8) and countryside; it is Britain's biggest National Park. It is located in the middle-west of Scotland.



Figure 8. Wildlife hosted in the Cairngorms National Park
(source: The Cairngorms National Park, 12/07/2007)

Despite the fact that Scotland has already two National Parks, the proposed Coastal and Marine Park is considered to be a novelty. New regulations or integration of frameworks are needed so that a Coastal and Marine Park could be established.

According to the *National Parks (Scotland) Act 2000*, the National Park aims are the following:

- (a). to conserve and enhance the natural and cultural heritage of the area;
- (b). to promote sustainable use of the natural resources of the area;
- (c). to promote understanding and enjoyment (including enjoyment in the form of recreation) of the special qualities of the area by the public; and
- (d). to promote sustainable economic and social development of the area's communities.

Therefore, the Scottish ministers proposed the designation of an area as a National Park, under the conditions

- (a) that the area is of outstanding national importance because of its natural heritage or the combination of its natural and cultural heritage;

- (b) that the area has a distinctive character and a coherent identity; and
- (c) that designating the area as a National Park would meet the special needs of the area and would be the best means of ensuring that the National Park aims are collectively achieved in relation to the area in a co-ordinated way (National Parks (Scotland) Act, 2000).

2.2 Scotland's geography

Scotland's coastline (Figure 9) is approximately 11,500 km long, equivalent to 10% of Europe's total coastline. Scotland's territorial waters (within 12 nautical miles of the coast) are greater in extent than its landmass. The country's fisheries zone (within 200 miles of the coast) covers 127,000 square miles of sea, nearly one quarter of the European Union waters. It has an exceptionally varied character, with diverse geological features including steep cliffs, deep sea lochs, islands, rocky reefs, sea caves, sandy beaches, machair, lagoons, salt marshes, estuaries and firths (The Scottish Parliament, 2007).



Figure 9. Map of Scotland
(source: Zetnet, a Scottish photo gallery, 12/07/2007)

Scotland's marine and coastal environment contains many special and some unique landscapes of national and international renown. According to The Scottish Parliament (2007), Scotland has distinctive habitats, such as sea lochs and maerl beds and Scottish waters are among the most diverse in the world, supporting 8,000 complex and over 36,000 single-cell species and animals. Some species like basking shark and leatherback turtle are of international significance.

According to the latest data available provided by the Joint Nature Conservation Committee (08/05/2007), Scotland has 140 Special Protection Areas (SPAs) sites and 1 site sharing with England (Table 1). Definition of the meaning of SPAs is given in Chapter 4. Therefore, Scottish sites contribute at a percentage of approximately 55.6% to the total of UK SPA sites.

Country	Classified SPAs		Potential SPAs *
	Number of sites	Site area (ha)	Number of sites
England	78	648 683	2
England/ Scotland	1	43 637	0
England/ Wales	2	37 748	1
Northern Ireland	14	108 207	2
Scotland	140	598 276	7
Wales	17	123 007	0
UK	252	1 559 558	12

* Figures exclude 2 potential SPAs which have been proposed in the UK Territory of Gibraltar

Table 1. Special Protection Areas in the UK as at 21 September 2006
(source: Joint Nature Conservation Committee, 08/05/2007)

Furthermore, Scotland's contribution to Special Areas of Conservation (SACs), which are strictly protected sites designated under the Article 3 of the EC Habitats Directive, is equally important. More information on SACs is provided in Chapter 4. According to

March 2006 data (Joint Nature Conservation Committee, 08/05/2007), Scotland has 236 SAC sites and 3 sites sharing with England (Table 2).

Special Area Conservation (SAC) ¹			Possible & Draft SACs (pSACs & dSACs) ^{2,3}	
Country	Number of sites	Area (ha)	Number of sites	Area (ha)
England	229	809 199	2	39 693
England/ Scotland	3	112 478	0	0
England/ Wales	5	5 552	2	89 243
Northern Ireland	53	65 913	0	0
Scotland	236	921 222	1	5 279
Wales	85	589 890	0	0
UK offshore waters	0	0	8	2 350 385
UK total	611	2 504 026	16	2 485 122

* Figures exclude 2 potential SPAs which have been proposed in the UK Territory of Gibraltar.

Table 2. Special Areas of Conservation and possible and draft SACs in the UK as at 21 September 2006
(source: Joint Nature Conservation Committee, 08/05/2007)

Explanation of site status:

1. Special Areas of Conservation (SACs) are sites that have been adopted by the European Commission and formally designated by the government of each country in whose territory the site lies.
2. Possible SACs (pSACs) are sites that have been formally advised to UK Government, but not yet submitted to the European Commission.
3. Draft SACs (dSACs) are areas that have been formally advised to UK government as suitable for selection as SACs, but have not been formally approved by government as sites for public consultation.

3 Objectives of this thesis

This chapter aims to clarify the objectives of this thesis. Designating a National Coastal and Marine Park could be seen from several points of view; internationally, nationally or locally. International or national criteria would probably promote an area that hosts important biodiversity and habitats at a European Union (EU) level like *Special Protection Areas* (SPAs), *Special Areas of Conservation* (SACs), *Sites of Special Scientific Interest* (SSSIs) and areas important for birds populations protected by the Birds Directive.

However, when it comes to a national or local level, some other criteria may be equally or even more important for the designation of a Coastal and Marine Park. This thesis focuses on the sustainable livelihood of the local communities that live on or by the designated area in question; 'Argyll Islands and Coast'.

The objective of this thesis is to study how the designation of a CMNP in Argyll Islands and Coast could enhance the viability of the local communities. Given the fact that there is no final model of the Park published, since the designation process was terminated, four options will be examined. It is expected that the Multi-Criteria Decision Analysis will reveal how each of the identified options performs in relation to the sustainable livelihood of the local communities.

4 Argyll Islands and Coast

The current chapter is a description of the case study area; demographic, environmental, historic characteristics and information related on tourism and recreation activities are presented. Activities such as fishing, aquaculture, shipping and navigation, renewables' energy deployment, sailing and boating, kayaking and canoeing, diving and marine and coastal wildlife watching are also included.

4.1 Introduction to the region

The case study area covers a big part of the Scottish coastline; the area is defined by the dark blue line in the north of the Island of Mull and by the dark green line in the south of the Island of Islay (Figure 1). There are numerous islands off the mainland shore. These include the large islands of Islay, Jura and Mull, as well other smaller islands, notably Gigha, Colonsay, Coll and Tiree. According to a Joint Nature Conservation Committee (1997) study which covered a wider area in the south-west Scotland, it was estimated that this area represented about 23.5% of the total coastline of Scotland. Given the fact that the current case study area omitted particular islands and coastal areas, it could be stated that the case study area represents about 20% of the Scottish coastline.

Low-intensity agriculture is a major land use, with stock rearing, notably sheep farming, predominating in the north. In the south, farming is more intensive and dairy herds are common. There are many fishing ports in the region, such as Oban and Loch Scridain (on Mull) and in adjacent regions, such as Campbeltown being the ports where most fish and shellfish are landed (Joint Nature Conservation Committee, 1997).

There are traditional holiday resorts and many small hotels and guest houses as the area is quite popular because of its beautiful landscape.

4.2 Population

According to JNCC (1997), in 1991 Argyll and Bute had a population of 90,550 people. The 1991 census results show that the populations of Lorn (centred on Oban), Mull and some of the other islands including Coll and Lismore all increased between 1981 and 1991, that of Mull by almost 15%. However, the southern parts of Argyll and Bute, including, Islay and Jura, all have declining populations. Nearly all (95%) of the population of Argyll and Bute is coastal. Coastal activities provide the livelihoods for a significant number of residents and many more make use of coastal land and waters for leisure activities. Several of the islands receive many holiday visitors in the holiday months.

According to the latest population census that took place on the 29th of April 2001 (General Register Office for Scotland, 2002) Argyll and Bute has a population of 91,306; the major population centers of the area are Helensburgh, Dunoon, Rothesay, Campbeltown and Oban. Because this area includes a larger region than that of the case study area, it is obvious that the population of Argyll Islands and Coast is smaller.

One could argue that an increase in population of only 756 people in a ten-year period of time is quite small. That is in agreement with one of the interviewees' sayings (Patrick Stewart) who actually pointed out that the communities are not really developing, while according to Scottish Executive (2006), the population of the entire area has been declining and is generally older and more affluent than the national average.

4.3 Natural environment, biodiversity and wildlife

The case study area includes a number of islands and isles, each of which has its own special character, with a number of important habitats (Scottish Executive, 2006). The environment of the area is unique both in terms of landscape beauty and environmental value.

The smaller islands are favoured by marine mammals such as common and grey seals, otters, harbour porpoises, minke whales and other cetaceans. Moreover, basking sharks are often seen in the area. There are numerous bird species and environmentally valuable sites throughout the whole case study area; the latter ones are designated under international and national directives.

4.4 Sites designated under international conventions and directives

- **Biosphere Reserves** (Joint Nature Conservation Committee, 1997)

Biosphere Reserves are non-statutory protected areas representing significant examples of biomes -terrestrial and coastal environment, throughout the world- protected for conservation purposes. They have particular value as benchmarks or standards for the measurement of long-term changes in the biosphere as a whole. They were devised by UNESCO as Project No. 8 of their Man and the Biosphere (MAB) ecological programme, and were launched in 1970. BRs for the case study area are listed in Table 3.

- **Ramsar sites** (Joint Nature Conservation Committee, 1997)

Ramsar sites are statutory areas designated by the UK government on the advice of the conservation agencies under the Ramsar Convention. They are designated for their waterfowl populations, important plant and animal assemblages, wetland interest or a combination of these: all Ramsar sites have first to be designated as Sites of Special Scientific Interest (SSSIs). Ramsar sites for the case study area are listed in Table 3.

Sites designated under international conventions and directives			
Site name		Area (ha)	Date designated
	Biosphere Reserves		
Taynish		362	1977
	Ramsar sites		
Islay	Duich Moss	574	1988
	Bridgend Flats	331	1988
	Rinns of Islay	2,926	1995
	Glac-na-Criche	265	1990
	Feur Lochain	384	1990
	Gruinart Flats	3,170	1988
Coll		2,177	1995

Table 3. Biosphere Reserves and Ramsar sites in the case study area
(source: Joint Nature Conservation Committee, 1997)

- **Special Protection Areas (SPAs)** (Joint Nature Conservation Committee, 1997)

The 1979 EC Directive on the Conservation of Wild Birds (also known as the Birds Directive) requires member states to take conservation measures particularly for certain rare or vulnerable species and for regularly occurring migratory species of birds. SPAs of the case study area are listed in Table 4.

Sites designated under international conventions and directives				
Special Protection Areas (SPAs)				
Site name		Area (ha)	Date designated	Qualifying interest
Islay	Duich Moss	574	1988	IIN of 2 roosting and feeding species of geese, wintering raptors; breeding seabirds, raptors and waterfowl
	Laggan Peninsula	1,270	1988	IIN of 2 wintering species of geese; breeding and wintering choughs <i>Pyrrhocorax Pyrrhocorax</i> ; breeding colonies of arctic and little terns <i>Sterna paradisaea</i> and <i>S. albifrons</i>
	Bridgend Flats	331	1988	IIN of wintering and roosting barnacle geese <i>Branta leucopsis</i> ; NIN of wintering scaup <i>Aythya marila</i> and red-breasted merganser <i>Merganser serrator</i> ; wintering waterfowl and raptors
	Rinns of Islay	2,926	1995	IIN of 2 species of wintering geese; nationally important breeding populations of 4 bird species and passage whooper swan <i>Cygnus cygnus</i>
	Glac-na-Criche	265	1990	IIN of 2 wintering species of geese; NIN of 4 breeding bird species, and of passage whooper swan
	Feur Lochain	384	1990	IIN of 2 wintering species of geese; NIN of 4 breeding bird species, and of passage whooper swan
	Gruinart Flats	3,170	1988	IIN of 2 wintering species of geese; NIN of breeding and wintering chough and breeding hen harrier <i>Circus cyaneus</i> ; wintering raptors and passage waterfowl
Treshnish Isles		208	1994	Internationally important for wintering barnacle geese; nationally important for breeding storm petrels <i>Hydrobates pelagicus</i> ; 9 species of breeding seabirds
Coll		2,177	1995	IIN of 4 breeding bird species, 3 species of wintering geese and 2 of wader species

IIN: Internationally important numbers, NIN: Nationally important numbers

Table 4. Special Protection Areas in the case study area
(source: Joint Nature Conservation Committee, 1997)

- **Argyll Marine Special Areas of Conservation (SACs)**

The designation of SACs is one of the main mechanisms by which the EC Habitats and Species Directive 1992 is implemented. SACs are areas identified as outstanding examples of selected habitat types or areas important for the continued well-being or survival of selected non-bird species (Argyll Marine SAC, 16/07/2007).

There are six marine Special Areas of Conservation (SACs) in Argyll (Figure 10):

1. The Firth of Lorn;
2. Loch Creran;
3. Treshnish Isles;
4. Lismore;
5. South-East Islay Skerries; and
6. Mòine Mhór.

Argyll and Bute Council have established the Argyll Marine Natura Project in partnership with Scottish Natural Heritage with supporting funds from West Highland European Leader Kist/Leader +.



Figure 10. Argyll Marine Special Areas of Conservation
(source: Argyll Marine SAC, 16/07/2007)

• The Firth of Lorn SAC

The Firth of Lorn SAC (Figure 11) encompasses a complex group of islands, sounds and inlets characterized by some of the strongest tidal streams in the UK. The Gulf of Corryvreckan, Bealach a'Choin Ghlais (Pass of the Grey Dogs) and the Sounds of Clachan, Cuan and Luining are some of the most outstanding tide-swept areas in the North East Atlantic. Rocky reefs in the area host a rich diversity of species and extend, in many places, from the intertidal zone into considerable depths (over 250 m).

A rapid transition in communities occurs with the deceleration of tidal streams; this classifies the area and the associated communities and species as amongst the most diverse in both UK and Europe. Among the frequently seen mammals are the Harbour Porpoise, the Bottlenose dolphin and the Minke whale.

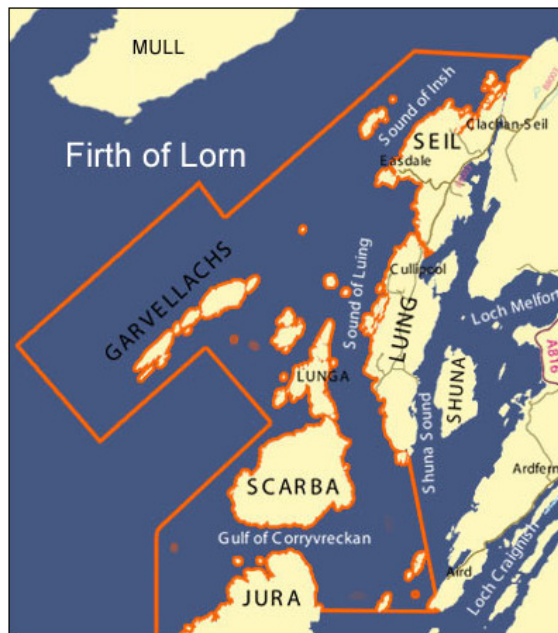


Figure 11. The Firth of Lorn SAC
(source: Argyll Marine SAC, 16/07/2007)

• Loch Creran SAC

Loch Creran (Figure 12) harbors a diverse range of marine habitats and species. The reason for the designation and uniqueness of this site is the presence of the outstanding biogenic reefs of two organisms; the polychaete worm *Serpula vermicularis* and the horse mussel, *Modiolus modiolus*. The abundance of these living reefs of serpulid worms makes Loch Creran a unique place worldwide.

Within Loch Creran the remarkable reefs grow most abundantly in depths of 6 – 10 m, and provide a habitat for a number of species such as red seaweeds, feathery hydroids, sponges, sea squirts, clams, brittlestars, small crabs and other worms. Life in the reefs is abundant as over 2500 animals have been counted on a single reef, comprising over 70 different species.

Furthermore, the value of the area increases because of the horse mussel reefs which cover large areas of seabed at depths of 13-25m. Again these reefs provide a habitat for lots of species such as red algae and sea firs, sponges, sea squirts and sea urchins. Additionally, the reefs provide a nursery ground for the young of other bivalves such as scallops and clams.



Figure 12. Loch Creran SAC

(source: Argyll Marine SAC, 16/07/2007)



Figure 13. The Treshnish Isles SAC

• The Treshnish Isles SAC

The Treshnish Isles area (Figure 13) are a remote chain of uninhabited volcanic islands and skerries situated 3 km west of the Island of Mull; it encompasses Lunga, Fladda and the Cairn na Burgh Islands. The reason for its designation is the internationally important colony of grey seals *Halichoerus grypus*. Around 1100 grey seal pups are produced each year, representing around 3% of the UK and 2.8% of the EU populations of the species.

However, the area is not only known as a seals habitat. Because it hosts bird colonies of national importance such as puffins, razorbills, guillermots, kittiwakes, fulmars and sags it has been designated as a Site of Special Scientific Interest (SSSI). Last but not least, it has also been designated as a Special Protection Area (SPA) for internationally important populations of the Storm Petrel (*Hydrobates pelagicus*) and the Barnacle Goose (*Branta leucopsis*).

• Lismore SAC

The island of Lismore (Figure 14), situated at the mouth of Loch Linnhe, is composed of the largest expanse of coastal limestone in western Scotland. Lismore SAC is a composite site comprising five groups of small offshore islands and skerries which are a nationally important breeding colony of the common seal *Phoca vitulina*.

Lismore represents one of the larger discrete colonies of common seals in the UK and is equivalent to around 2% of the UK and 1% of the EU populations of the species.



Figure 14. Lismore SAC
(source: Argyll Marine SAC, 16/07/2007)

• South-East Islay Skerries SAC (Islay)

The south-east Islay Skerries marine SAC (Figure 15) has been designated for its common seal *Phoca vitulina* colony and encompasses the offshore islands, skerries and the mainland coastline between Lagavulin Bay and Ardmore Point.

There are dense kelp forests which ensure food supply for the seals and represent about 2% of the UK population and 1% of the EU population.

Islay provides an important habitat for birds, a fact which is reflected by the 5 SPAs in the island.



Figure 15. South-East Islay Skerries SAC
(source: Argyll Marine SAC, 16/07/2007)

🌊 Mòine Mhór SAC

Designated habitats on the 835-hectare Mòine Mhór site (Figure 16) include Atlantic salt meadow, intertidal mudflats and sands, degraded (still capable of natural regeneration) and active raised bog. The site is also designated for the species *Lutra lutra* (Otter) and *Euphydryas aurinia* (Marsh fritillary butterfly).



Figure 16. Mòine Mhór SAC
(source: Argyll Marine SAC, 16/07/2007)

Loch Crinan (part of the Mòine Mhór SAC) contains one of the largest expanses of intertidal mudflats and sandflats in western Scotland. Therefore, it hosts a variety of brackish sediment habitats which are home to species communities. The reason for the uniqueness of this site is the rarity of these brackish sediment habitats on the west coast of Scotland.

● **Environmentally Sensitive Areas (ESAs)**

ESAs are statutory areas in which the Government seeks to encourage environmentally sensitive farming practices, prevent damage that might result from certain types of agricultural intensification, and restore traditional landscapes, for which member states are allowed to make payments to farmers (Joint Nature Conservation Committee, 1997). Table 5 depicts ESAs in the case study area.

Environmentally Sensitive Areas	
Argyll Islands	machair, coastal and herb rich grasslands (including hay meadows), heather moorland, native woodland, scrub, wetlands, dunes, saltmarsh, peatlands and rushy mirs; many breeding birds including corncrake <i>Crex crex</i> and waders; well-preserved archaeological features including prehistoric remains, 17-19 th century settlements and field systems

Table 5. ESAs in Argyll Islands
(source: Joint Nature Conservation Committee, 1997)

4.5 Sites established under national statute

- **National Natural Preserves (NNRs)**

NNRs contain examples of some of the most important natural and semi-natural ecosystems in Great Britain. They are managed to conserve their habitats, providing special opportunities for scientific study of the habitats, communities and species represented within them (Joint Nature Conservation Committee, 1997). There are 5 NNRs in the case study area (Table 6).

- **Sites of Special Scientific Interest (SSSIs)**

SSSIs are notified under the Wildlife and Countryside Act 1981. They are intended to form a national network of areas, representing in total the parts of Britain in which the natural features, especially those of greatest value to wildlife conservation, are most highly concentrated or of highest quality. SSSIs in the region include many sites of interest for their lower plants, terrestrial invertebrates, mammals, breeding seabirds or internationally important migrating bird populations (Joint Nature Conservation Committee, 1997). There are at least 39 sites designated as SSSIs in the case study area; these are listed in Appendix 1.

Sites established under national statute			
National Natural Reserves			
Site name	Area (ha)	Date last declared	Habitats
Mealdarroch	205	1987	scattered woodland on steep slopes, gorges, Atlantic bryophytes and fern species
Taynish	362	1977	native deciduous woodland, foreshore and sea lochs
Moine Mohr	493	1987	raised mire, wetlands (acid peat to saltmarsh)
Eilean Na Muice Duibhe, Islay	360	1993	blanket mire with peaty pools and lochans
Glasdrum Wood	169	1967	deciduous woodland

Table 6. National Natural Reserves in the case study area
(source: (Joint Nature Conservation Committee, 1997)

- **National Scenic Areas**

National Scenic Areas are designated by Scottish Natural Heritage as the best of Scotland's landscapes, deserving special protection in the nation's interest. There are 5 NSAs in the case study area (Table 7).

Sites established under national statute		
National Scenic Areas		
Site name	Area (ha)	Date designated
Kyles of Bute	4,400	1980
Knapdale	19,800	1980
Jura	21,800	1980
Scarba, Lunga & the Garvellachs	1,900	1980
Lynn of Lorn	4,800	1980
Loch Na Keal, Isle of Mull	12,700	1980

Table 7. National Scenic Areas in the case study area
(source: Joint Nature Conservation Committee, 1997)

4.6 Marine and coastal historic environment

The value of the Argyll and Bute coastline is enhanced by the presence of numerous historical sites. The impact of early Celtic peoples remains strong in the archaeology, place names and patterns of settlement (Scottish Executive, 2006). The formation of the Gaelic Kingdom "*Dalriada*" (or "*Dál Riata*") in Northern Ireland and West coast of Scotland (Figure 17) endowed the case study area with important historical heritage sites. Dalriada is "roughly conterminous with the old counties of Argyll and Bute; it comprises Kintyre, Cowal, Bute, Knapdale and mid-Argyll up to the Lorn, including the islands of Coll and Tiree, Mull and its outliers, Lismore and Colonsay as well as the coastal islands south to Jura, Islay and Gigha" (Sharpe, 2000).



Figure 17. The post- Roman kingdoms of Britain; Dalriada is covering the same areas as about the old counties of Argyll and Bute (source: Armit, 1997)

Overall, there is a number of medieval castles, historic sites, shipping remains and wrecks along the Scottish coastline that are in need for protection under a proper planning and management system.

4.7 Activities – Pressures

4.7.1 Inshore fisheries

The aim of the Sustainable Framework for Scottish Sea Fisheries published in 2005 (Scottish Executive, 2005) is “a Scottish sea fishing industry that is *sustainable* and *profitable* and supports strong local communities, *managed effectively* as an integral part of coherent policies for the marine environment”. Fisheries are an economically important aspect for coastal communities such as communities living in Argyll Islands and Coast. They should be sustainably managed, so that environmental status is improved and, as a result, the viability of local communities in the area is guaranteed. Argyll Islands and Coast belongs in the Scottish areas which are heavily dependent on fisheries and on a number of fisheries’ related industries, such as ship builders and repair businesses, net makers, ice and other ship suppliers and depends on ports, harbours and other infrastructure (Scottish Executive, 2005 – Natural Scotland).

Ports and fish landings

According to the same publication (Scottish Executive, 2005 – Natural Scotland), ports and fish landings were counted for the whole of Scotland. Therefore, 10 ports with less than 500 total tonnes landed, 2 ports with 500-1000 total tonnes landed, 1 port with 1000-10000 total tonnes landed and 1 port with over 10000 total tonnes landed, were counted in the case study area for 2003 (Figure 18).

Fishing vessels

The fishing fleet in the case study area is distributed as following: there are 7 vessels with an average length of 8 meters, 72 vessels with an average length of 12 meters, 110 vessels with an average length of 24 meters and 15 vessels with an average length of 40 meters (Figure 18).

Fish species of major commercial interest

There are seven top commercial fish species of major interest to Scotland:

- herring;
- haddock;
- *Nephrops* (prawns);
- mackerel;
- cod;
- scallop; And
- monkfish.

In south-west Scotland, the fleet mainly fishes for shellfish such as prawns *Nephrops*, scallops, lobsters and crabs and less regularly for sprats, herring and whitefish. As prawns, scallops, lobsters and crabs are benthic marine organisms, the fishing method used is trawling. Trawlers and scallop dredging harm the seabed because along with the fished organisms part of the substratum is also extracted. As a result, all the endobenthic (organisms that live in the sediment), epibenthic (organisms that live on top of the sediment) and hyperbenthic (organisms that live just above the sediment) flora and fauna communities are also removed. This results in the further degradation of the sea bed and has a major impact on associated communities of species and habitats.

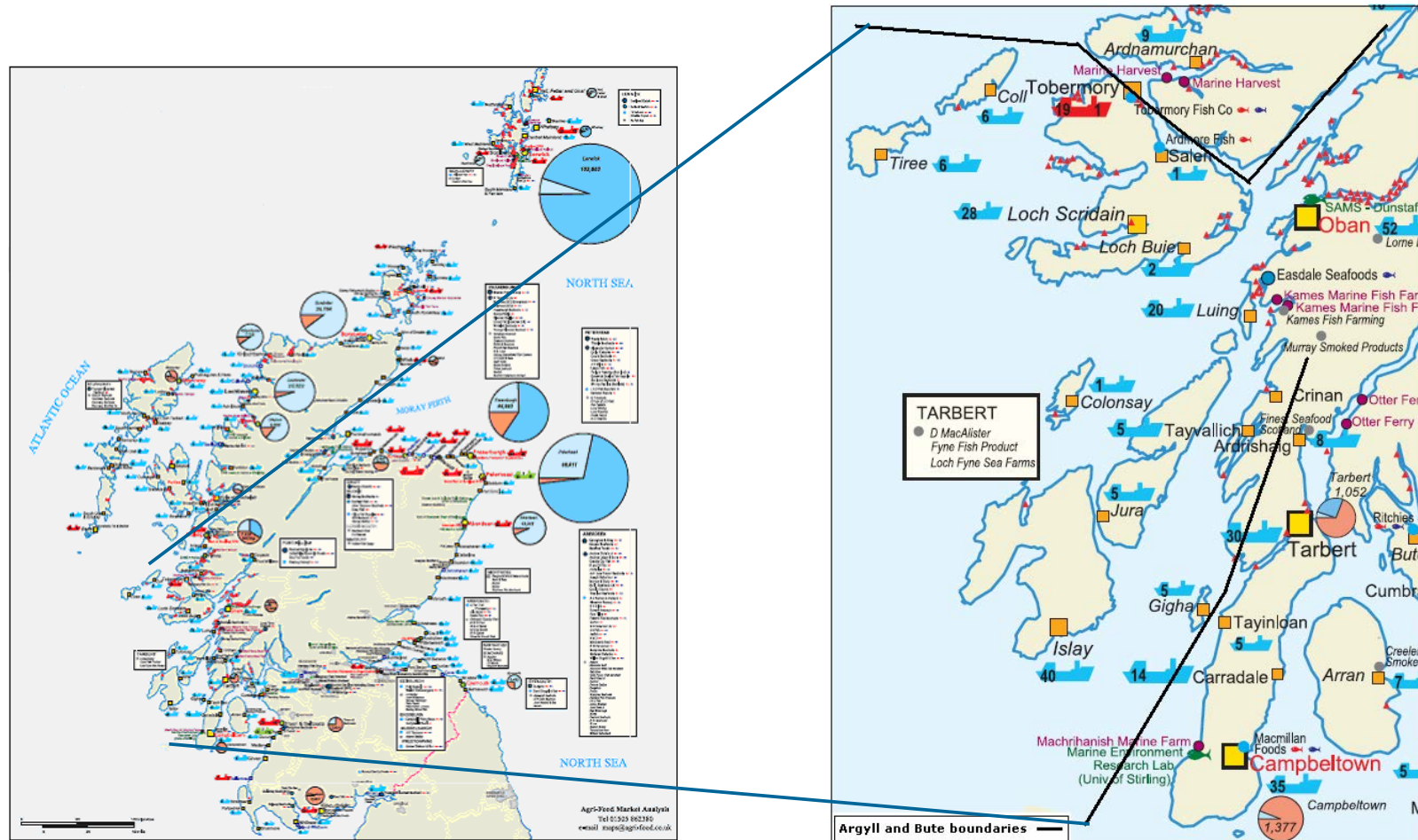


Figure 18. Scotland sea fisheries industry; Argyll Islands and Coast (on the right) (source: Scottish Executive, 2005 – Natural Scotland)

Fishermen employed

Scotland employs 5006 fishermen in total, 3918 full-time and 1018 part-time (Scottish Executive, 2005 - Natural Scotland). Oban, which is a port where more than 10000 total tonnes were landed in 2003, employs about 310 fishermen (Figure 19). Two hundred and eighty of them are regularly employed, 20 are irregularly employed, while 10 of them are crofters.

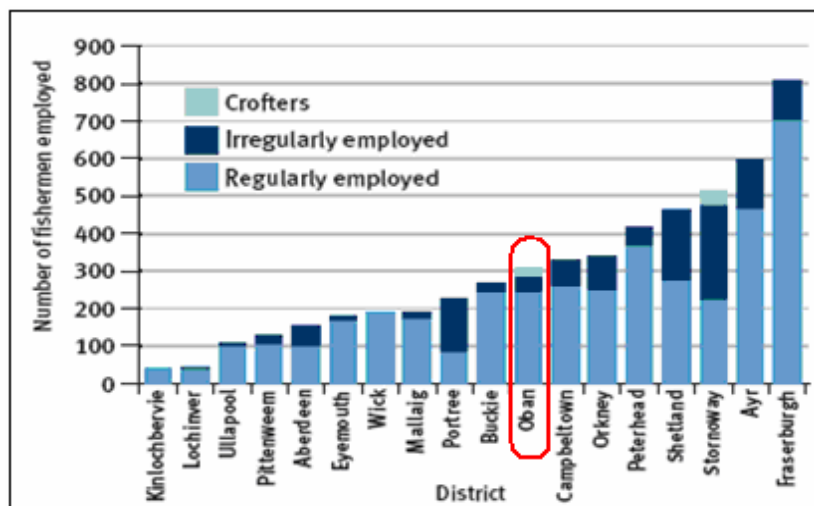


Figure 19. Number of fishermen employed by district and employment status, 2003
(source: Scottish Executive, 2005 – Natural Scotland)

Fish processing sector

It looks as if Scottish people are becoming more and more concerned about aspects such as healthy food and protection of the environment during the last few years; people are now more interested in Omega 3 oils the food might contain and the "food miles" it takes to get to the selling point; a fact which gives a push in fish consumption and seafood processing industry in Scotland. More specifically, "the £2.2 billion UK seafood market is growing at around 10 per cent a year, outperforming meat and poultry" (Donald, 31 May 2007). Fish processing sector is an important fisheries' related industry; in Scotland, there are 230 seafood processing plants where 6846 people are employed, 167 of which are in Argyll and Bute (Figure 20). Scottish langoustine, *Nephrops Norvegicus*, seems to be the

new opportunity area in Scottish seafood industry. According to the deputy chief executive of Young's seafood, Mike Parker, it is their key objectives to develop a new market for Scottish langoustine (Donald, 31 May 2007). Finally, according to Scottish Executive (2005 – Natural Scotland), Argyll and Bute is one of the areas that are heavily dependent on direct employment in production of fish products. This phenomenon is particularly seen in village communities such as Islay and Gigha.

County	Full-Time Equivalent Employees
Aberdeenshire (inc. Aberdeen city)	3,952
Angus	166
Argyll and Bute	167
Dumfries and Galloway/ Dumfriesshire	609
Highland/Sutherland	332
Lanarkshire/Ayrshire	524
Lothian	183
Moray	250
Orkney/Shetland	301
Scottish Borders	120
Western Isles	156
Fife/Perth and Kinross	85
Grand Total	6,846

Figure 20. Employment in Processing of Marine Fish (full-time equivalent), 2004
(source: Scottish Executive, 2005 – Natural Scotland)

Fisheries in Scotland are currently managed according to Common Fisheries Policy (CFP). The two most important principles that underpin this policy are the precautionary principle, which implies taking action in order to prevent something from happening and where there is not enough scientific knowledge not go forward; and the ecosystem approach principle, which aims at the integrated sustainable management of land, water and living resources considering all of the aforementioned aspects in an equitable way (Convention on biological diversity, 11/08/2007).

4.7.2 Aquaculture

Before start citing fisheries data, it is important to mention that it was extremely difficult to find specific data for the study area under consideration. Most of the data found were considering the Scottish coastline as a whole; therefore, some of the numbers mentioned below are not accurate and are based on some necessary assumptions. Furthermore, some sources referred to the specific case study area but the data provided were categorized by species (for example, Atlantic salmon, and rainbow trout) and others were divided by groups of species (for example, freshwater finfish, and seawater finfish). As a result, there are no indicative numbers for all species for the area but rather aggregated numbers. However, the assumptions made are considered to be reasonable and the numbers offer an idea of the magnitude of fish and shellfish farms and staff employed in the area. It is also necessary to mention that a lot of the information cited below comes from personal communication with several people from different organizations.

Under the Registration of Fish Farming and Shellfish Farming Businesses Order 1985 all finfish and shellfish farming businesses in Scotland are required to register with Fisheries Research Services within two months of commencing business. A snapshot of the current register reveals that in Argyll and Bute as of 11/06/2007 (Table 8) there are:

	Active sites *	Inactive sites**	Total numbers
Shellfish sites	88	73	161
Freshwater Finfish sites	34	31	65
Seawater Finfish sites	61	35	96
Total number of aquaculture sites		322	

* **Active:** status of a site that is stocked or fallow with the intention of restocking in the foreseeable future.

** **Inactive:** status of a site that is unlikely to be stocked in the foreseeable future.

Table 8. Aquaculture data for the Argyll and Bute
(source: White J., 2007, personal communication)

Research on the economic value of aquaculture for the case study area was committed. However, after personal communication with Holmes H. (2007) the author was informed that Scotland does not collect detailed information related to aquaculture businesses in a specific part in Scotland. Therefore, the latest available data (2005) on the economic value of the aquaculture business are presented below (Holmes H., 2007 – personal communication):

Aquaculture produces around 150,000 tonnes annually, with an output value of £280M. This is made up of £260M for farmed salmon, about £10M for rainbow, brown and sea trout, about £2M for halibut and cod, and about £6M for shellfish. The value of fish exports (including aquaculture products) from Scotland in 2005 was £422M. This accounts for 60% of all food exports (£700M).

● Fish farms

Rainbow trout (*Oncorhynchus mykiss*)

Fish farms data were quite difficult to find, especially because no actual data were found for the specific case study area. Trout production figures for 2005 are presented in Table 9 (Scottish Executive, 2005 - Fish Farms survey). Regions are presented as North, East, West and South. Both productivity per site and productivity per person were greatest in the west, 147.5 tonnes and 70.4 tonnes respectively. The case study area is included in the region named as “West” (personal communication with Smith R., 2007). However, no specific percentage can be estimated.

Area	No. sites	Table production (tonnes)	Mean tonnes per site	Staffing			Productivity tones/person
				Full time	Part time	Total	
North	14	917	72.4	16	4	20	50.6
East	19	1516	95.3	34	8	42	43.1
West	21	3009	147.5	35	9	44	70.4
South	16	728	66.8	23	14	37	28.9
All	70	6170	99.8	108	35	143	48.9

Table 9. Production and staffing by area for the rainbow trout (*Oncorhynchus mykiss*); Argyll Islands and Coast is included in the West region data (source: Scottish Executive, 2005 - Fish Farms survey)

Sea water salmon (*Salmo salar*)

The closest sea water salmon data were found in a Scottish Executive publication (2005, Fish Farms survey). The data presented in this publication use an amalgamation of old local authority areas (Smith R., 2007 - personal communication). The regions are presented as North West, Orkney, Shetland, South West and Western Isles. The old Argyll region is represented by South West (Smith R., 2007 - personal communication), (Table 10).

Region	Staff		Productivity (t/person)	Salmon (tonnes)
	F/T	PT		
South West	188	36	148	16,951
All Scotland	851	128	132	61.850

Table 10. Manpower and production (tonnes) by production area 2005
(source: Scottish Executive, 2005 – Fish Farms survey)

The old Argyll region (Figure 21) is bigger than the case study area, as it encompasses the Kintyre Peninsula. Therefore, it is expected that the sea water salmon data stated above are lower for the case study area.



Figure 21. The old Argyll region
(source: Town and Regional Planning Scottish Unitary Authorities, 14/08/2007).

According to 2002 data, the South West region (basically Argyll and the Inner Hebrides apart from Skye) and the Western Isles are responsible for the 18% of farmed salmon output (Figure 22) (Scottish Executive, March 2004). Since 15% of farmed salmon is produced in Western Isles, it would not be a big assumption if it was considered that about 3% of this salmon is produced in Argyll Islands and Coast.

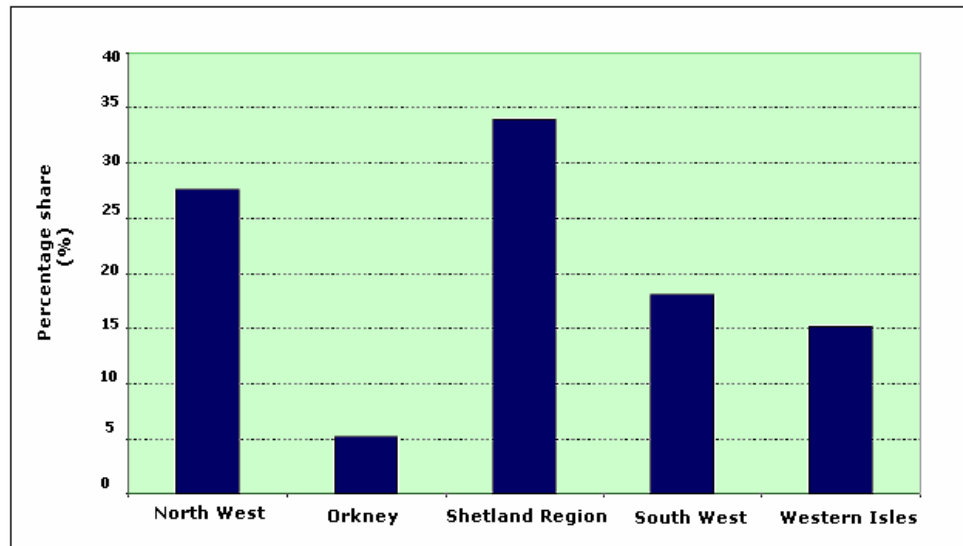


Figure 22. Regional distribution of farmed salmon production 2002
(source: Scottish Executive, March 2004)

Given the data available, it is difficult to state exact numbers of output value for the study area under consideration. Therefore, some assumptions are necessary. As mentioned above, the output value for farmed salmon in 2005 for the whole of Scotland is £260M. Moreover, according to 2002 data, about 3% of the farmed salmon is produced in Argyll Islands and Coast. Assuming that this percentage has not changed much, the output value of farmed salmon for Argyll can be derived. So, according to calculations, this value is £7.8M.

● Shellfish farms

According to the survey conducted by The Fisheries Research Services of the Environment and Rural Affairs Department (Scottish Executive, 2005 – Shellfish Farm survey), the shellfish species cultivated in Scottish waters are:

1. Common mussel: *Mytilus edulis*;
2. Pacific oyster: *Crassostrea gigas*;
3. Native oyster: *Ostrea edulis*;

4. Scallop: *Pecten maximus*; and

5. Queen: *Chlamys opercularis*.

According to the survey studied, Scottish coastline is divided in 5 production areas; Highland, Orkney; Shetland; Strathclyde and Western Isles (Figure 24). The initial data for all the areas are presented in Figure 23. Argyll Islands and Coast -the case study area- belongs in Strathclyde and according to calculations made, numbers for Argyll Islands and Coast correspond to 91.45% of Strathclyde numbers.

Total Scottish production was dominated by mussels and Pacific oysters. Small numbers of queens native oysters and scallops were also produced (Figure 23). According to further calculations, Argyll Islands and Coast is responsible for the following percentages of shellfish production in 2005:

Pacific oysters: 73.75%

Native oysters: 91.45%

Mussels: 28.35%

Queens: 82.63%

Scallops: 21.95%

Region	Companies	Pacific oysters (000s)		Native oysters (000s)		Mussels (tonnes)		Queens (000s)		Scallops (000s)	
		Table	On-growing	Table	On-growing	Table	On-growing	Table	On-growing	Table	On-growing
Highland	48	583	703	0	0	364	0	139	0	76	382
Orkney	12	10	0	0	0	4	0	0	0	0	0
Shetland	42	1	0	0	0	2,150	0	0	0	0	0
Strathclyde	60	2,476	764	162	0	1,269	20	1,302	0	24	0
Western Isles	20	0	0	0	0	347	0	0	0	0	0
Scotland	182	3,070	1,467	162	0	4,135	20	1,441	0	100	382
Weight (tonnes)		246		13		4,135		58		12	

Figure 23. Scottish shellfish production survey 2005 Regional production
(source: Scottish Executive, 2005 – Shellfish Farm Survey)

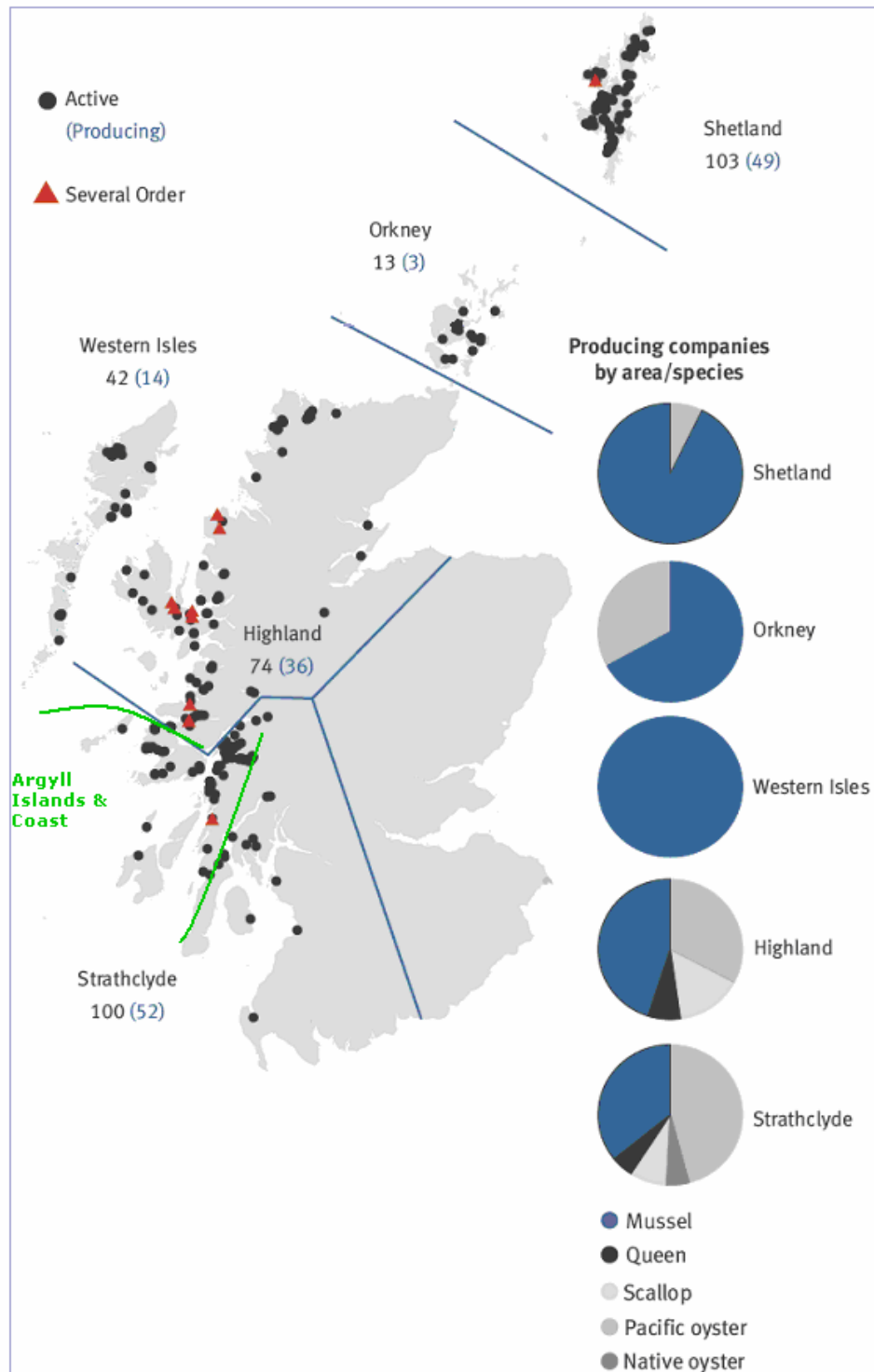


Figure 24. A map of Scotland showing the regional distribution of shellfish production sites 2005 by area/species (source: Scottish Executive, 2005 - Shellfish Farm Survey)

It is obvious that Argyll Islands and Coast is the biggest Pacific oyster production centre in the whole Scottish coastline. Almost 81% of pacific oysters were produced in the Strathclyde region and Argyll Islands and Coast has the biggest share of that (73.75%).

According to the same survey (Scottish Executive, 2005 - Shellfish Farm Survey), there are 152 shellfish farm sites in Strathclyde (2005 data); this number includes both “active” (growing and placing on the market) and “producing” (placing on the market for the table and on-growing) shellfish farm sites. The corresponding number for Argyll Islands and Coast was calculated at 139 sites. However, after personal communication with White J. (2007) and as already cited above, the number of shellfish sites under the 11/06/2007 register increased to 161 in total (both active and producing). The increase of about 20 sites in a period of only two years shows that the case study area is a very important shellfish-farming center. Therefore, it would not be unreasonable if one argued that shellfish farming play an important role in the viability of local communities in the area.

Unfortunately, the latest employment data in shellfish farms in Argyll Islands and Coast are found in the Scottish Executive (2005) shellfish farm production survey. According to this survey and to further calculations, the staff employed in shellfish farms in Argyll Islands and Coast in 2005 is 66 people employed full-time, 40 people employed part-time and 29 casual workers. It is recognized that these numbers may be not quite accurate as assumptions were made during the calculations. However, these numbers do give an idea of the staff employed in the case study area.

Moreover, as mentioned above, the number of shellfish farm sites has increased in the area. The above calculations are based on 2005 data, according to which about 139 farm sites existed in the area. Given the fact that sites have increased to 161, one could assume that the total staff employed must have increased too.

4.7.3 Shipping and navigation

Because of its geographical position, Scotland has busy marine links in terms of navigation and shipping. Its waters are intensively used by a variety of vessels such as tankers, fishing, passenger and dry cargo vessels (Scottish Executive, March 2007). The case study area is not that loaded compared to others but Firth of Clyde, which is adjacent to Argyll Islands and Coast, is considered to be key area of high vessel densities (Scottish Executive, March 2007). Moreover, in the case study area, there are busy ferry link connections between the land and the islands, especially between the islands of Mull, Coll and Tiree. Therefore, if a CMNP was to be designated in the area, shipping and navigation routes would have to be carefully considered.

4.7.4 Renewables' energy deployment

Drivers for renewables' development and implementation

There are several drivers that make the development of UK's renewable energy an imperative need; political factors as the UK's Kyoto Protocol commitment to reduce, by 2012, GHG emissions by 12.5% from 1990 levels, economic factors such as the increasing fossil fuel-based energy prices, -it is estimated that by 2020 UK "could be importing 90% of its gas" (Foot *et al.*, 2006) - and environmental factors such as climate change.

Scotland's coasts are among the windiest in Europe; this fact contributes to windfarms' development. More specifically, wind's speed in the case study area reaches the speed of 6m/sec in sheltered terrain, while in the open sea wind's speed could be bigger than 11m/sec (Figure 25).

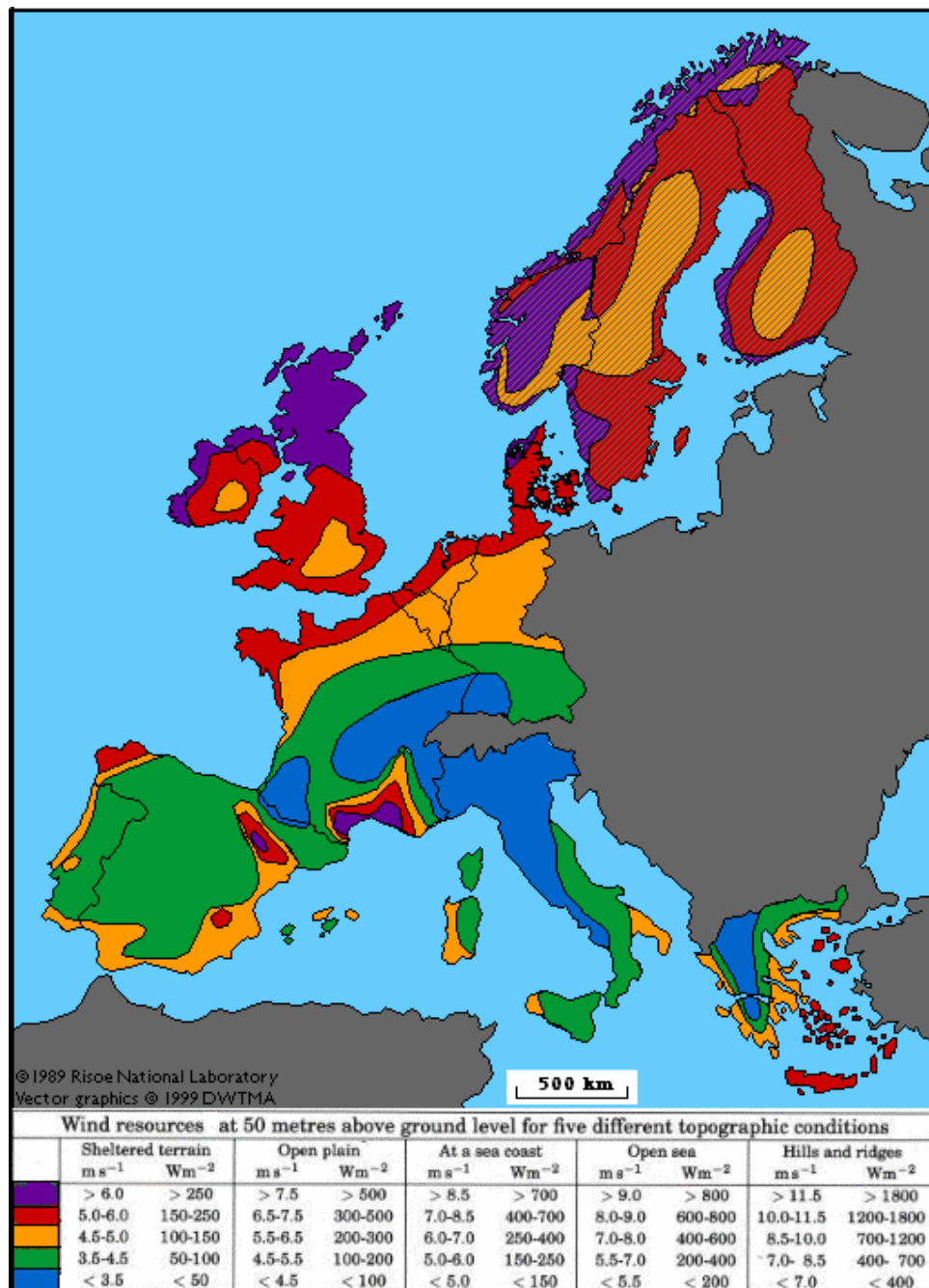


Figure 25. European wind resources
(source: European Wind Resource and European Wind Atlas, June 2007)

Furthermore, there are important wave and tidal resource areas in the whole of the north, west and south Scottish coastline; in the case study area there are both wave and tidal resources (Figure 26).

Scotland is richly endowed with renewable wind and hydro energy resources; this fact adds to the already existing pressures in the coastal and marine environment.

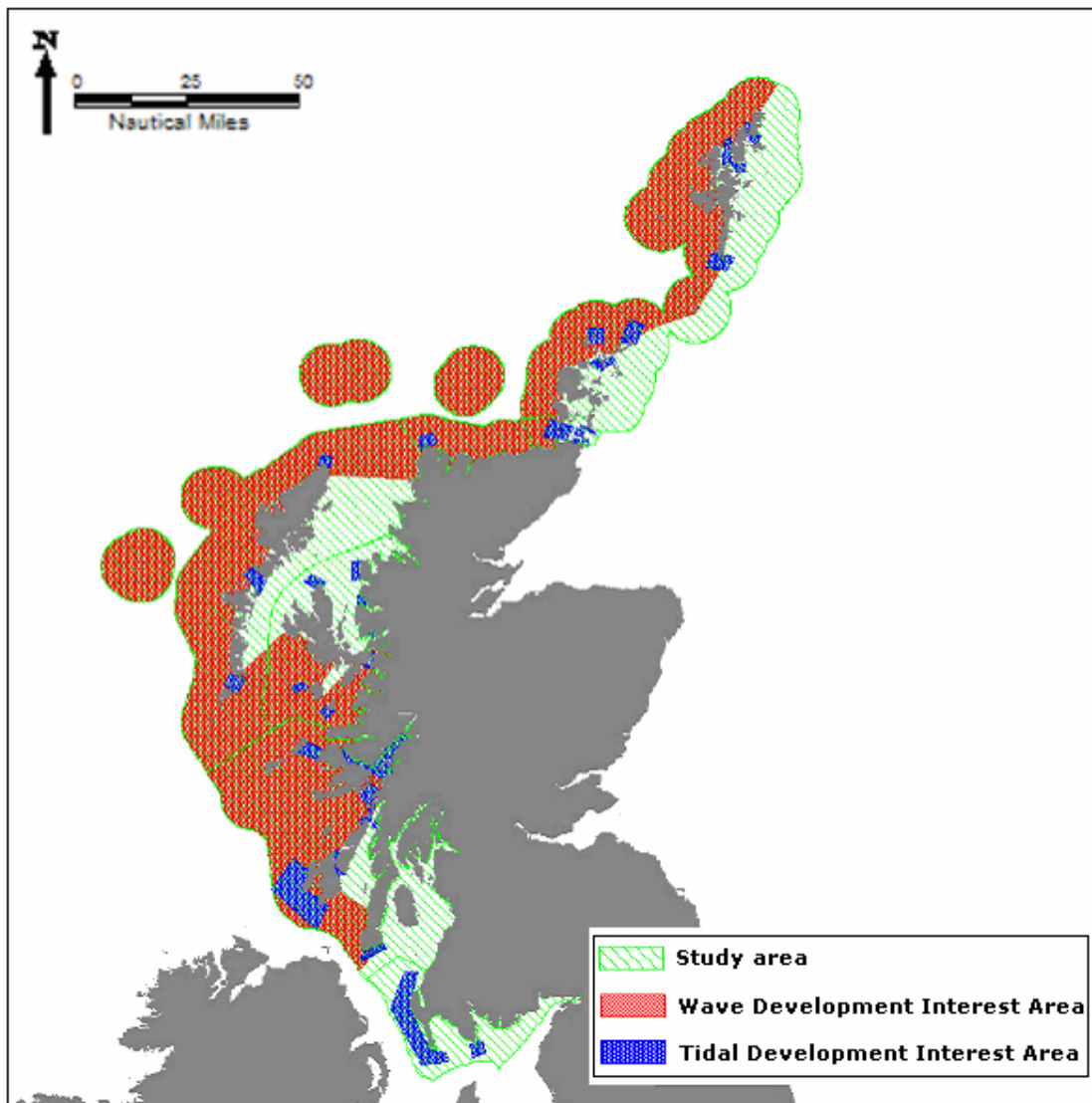


Figure 26. Potential development areas of marine renewables in Scotland
(source: Scottish Executive, March 2007)

4.7.5 Tourism and recreation

According to labour market profile data (NOMIS, 2005) tourism-related industries account for 13.8% of all industries in Argyll Islands and Coast (Table 11). There are 5,100 people employed in tourism-related sections. This represents about 1.22% of tourism-related employments in Scotland. Tourism-related sections include the following sectors:

- ♣ Hotels;
- ♣ Camping sites;
- ♣ Restaurants;
- ♣ Bars;
- ♣ Activities of travel agencies;
- ♣ Library, archives, museums;
- ♣ Sporting activities; and
- ♣ Other recreational activities.

	Argyll and Bute (employee jobs)	Argyll and Bute (%)	Scotland (%)	Great Britain (%)
Employee jobs by industry				
Manufacturing	1,300	3.6	9.6	11.1
Construction	2,100	5.7	5.4	4.6
Services	30,600	83.6	82.0	82.9
Distribution, hotels and restaurants	9,100	25.0	22.4	24.1
Transport and communications	1,800	4.9	5.4	6.0
Finance, IT, other business activities	4,600	12.7	18.5	20.7
Public admin, education and health	13,300	36.4	30.3	26.9
Other services	1,700	4.7	5.3	5.2
Tourism-related	5,100	13.8	8.8	8.1

Notes: % is a proportion of total employee jobs

Employee jobs excludes self-employed, government-supported trainees and HM Forces

Table 11. Employee jobs in Argyll Islands and Coast (source: NOMIS, 2005)

Sailing and boating

Sailing is a major recreational activity in the west coast of Scotland. The west coast is more sheltered than the north one and its clean waters attract many fans of the sport. There are 12 sailing schools based within the study area (SailScotland, 15/07/2007). Obviously these are operating within Argyll and Bute; however, there are more sailing schools operating in the south-west part of Scotland which may also use the waters of Argyll and Bute.

Moreover, there is a number of RYA (Royal Yachting Association) General Sailing Areas in most of the sounds, lochs and firths off Argyll and Bute (Scottish Executive, March 2007). There are 6 Royal Yachting Association (RYA) marinas/yacht havens operating within the case study area. Their locations are listed in Table 12.

Royal Yachting Association (RYA) Marinas and Yacht Havens	
Argyll Islands and Coast	Ardfern Yacht Centre
	Craobh Marina
	Dunstaffnage Marina
	Kilmelford Yacht Haven
	Melfort Pier and Harbour
	Oban Marina

Table 12. Royal Yachting Association (RYA) Marinas and Yacht Havens in Argyll Islands and Coast
(source: Scottish Executive, March 2007)

Kayaking and Canoeing

As kayaking and canoeing are informal activities they can take place throughout the whole west coast. Therefore, the waters in Argyll Islands and Coast can be used by kayaking and canoeing schools that are not based in the case study area. However, it might be useful to mention that there are 2 sea kayaking clubs in Oban and 26 canoeing clubs in Strathclyde, Argyll and Bute (Scottish Executive, March 2007).

Diving

Argyll Islands and Coast attracts lots of divers because of its clean waters, seabed geomorphology and rich benthic communities. Shipwrecks, such as SS Rondo and SS Hispania, both situated in the Sound of Mull, is a separate factor which makes the case study area's waters more appealing. There are three diving schools that are operating in the case study area (Tourist Net UK, 19/07/2007). Nevertheless, it should be mentioned that qualified divers do not need a permission to dive; therefore, the numbers of divers cannot be actually recorded.

Marine and coastal wildlife watching

According to a Scottish Board Tourism publication (1998), 40% of visitors to Scotland rated wildlife as one of the country's most likeable features. A survey carried out by Smyth (1998, as cited by Woods-Ballard *et al.*, 2003) revealed the preferences of visitors concerning wildlife. The first 4 places are occupied by sea birds and marine mammals (Table 13). Therefore, it is obvious that wildlife watching plays an important part in Scotland's tourism share.

Popularity rating	Animal
1	whales and dolphins
2	sea birds
3	seals
4	wildfowl
5	birds of prey
6	badgers
7	otters
8	deer
9	pine marten
10	capercaillie

Table 13. The most popular wildlife attractions in Scotland
(source: Smyth 1998, as cited by Woods-Ballard *et al.*, 2003)

Bird watching

Scotland's unique coastal environment provides home for many bird species. There are resident species but also migratory birds that use Scottish ground to rest and refuel during migration. Bird watching is quite popular while there are even holiday packs that offer visits during which one can watch the birds' spring and autumn migration. There are 9 SPAs designated according to the 1979 EC Directive on the Conservation of Wild Birds in Argyll Islands and Coast as listed in Table 4. There are also bird tours organized and visitors are given the opportunity to view species which spend very little time on shore and individuals such as the rare white-tailed sea eagle hunting for fish off the Argyll coastal area (Scottish Executive, March 2007).

Additionally, Argyll Islands and Coast has also 2 RSPB (Royal Society for the Protection of Birds) reserves; Coll, Loch Gruinart and the Oa. In Coll and Loch Gruinart one can watch corncrakes in spring and summer, and large numbers of barnacle and Greenland white-fronted geese in autumn due to their arrival from Greenland. Golden eagles, seabirds, choughs and hen harriers are often seen in the Oa (Royal Society for the Protection of Birds, 22/07/2007).

Marine mammals watching

As mentioned above (Table 13) whales, dolphins and seals are rated in the top three popular Scottish wildlife attractions. Argyll Islands and Coast contains significant numbers of grey and common seals which are mainly in the Treshnish Islands, Lismore and Firth of Lorn, all of them being designated SACs. The Treshnish Islands, also designated SSSI, are an important breeding ground for grey seals, while Lismore is one of the largest breeding colonies in the UK for the common seal. Harbour porpoises are widespread in nearshore waters and particularly in Kyles of Bute, the Sound of Jurra, the Firth of Lorn, the Sound of Mull, Coll and Tiree (Joint Nature Conservation Committee,

1997). Mink whales occur regularly in the Firth of Lorn, around the Treshnish Islands and the island of Mull. Common dolphins are frequently seen in Coll while Risso's dolphins occur in Mull, Coll and Tiree.

On the whole, it is noticeable that the coastline of the case study area serves numerous activities and is used for many and different purposes. Argyll Islands and Coast consists of many unique environmental and historic sites. The two most important income-generating activities for the rather declining population are tourism and shellfish fishing and farming.

5 Coastal Zone Management Initiatives

Given the fact that the CMNP is not going to be designated, it was considered important to explore the alternative options that are currently considered.

First of all, the Scottish Government recently announced the introduction of a Scottish Marine Bill. Secondly, it looks as if Local Coastal Partnerships are going to be one of the implementation tools of Integrated Coastal Zone Management and Marine Spatial Planning around the Scottish coastline in the future. Although these options are not going to be explored in the Multi-Criteria Decision Analysis, it is considered necessary to cite them as more up-to-date information.

5.1 Scottish Marine Bill

The new Scottish Government announced the introduction of a Scottish Marine Bill at the Oceans '07 conference that took place in Aberdeen on the 19th of June 2007. The Scottish Marine Bill aims to deliver the following tasks (Scottish Executive, 2007):

- a simpler regulatory system for the marine environment;
- more action on marine nature conservation;
- a strategic national approach; and
- greater local control over marine and coastal areas.

There was also some debate about the new Marine Bill at the Scottish Coastal Forum, - which the author attended- which took place on the 26th of June at Fort Matilda (west coast of Scotland); the Scottish Marine Bill is about to be formed by 2010.

A Scottish Marine Bill is necessary since most aspects and activities within 12 nautical miles of the Scottish coast are managed by the Scottish government. Its introduction is possibly going to be within the bounds of the UK Marine Bill; however, the formation of the Scottish Marine Bill presents some differences compared to the UK one which could also be seen as challenges. Most of the aquaculture units and fish farms are located in Scotland; moreover, Scotland is a very important marine transportation link to the rest of the UK. These differences have to be taken into account as there is no point of establishing a new framework unless it can operate within the area under consideration.

5.2 Local Coastal Partnerships (LCPs)

During the last 23 months there has been a number of coastal management initiatives proposed; among these are the UK Marine Bill, the publication of the Executive's own Strategy for a Marine and Coastal Strategy, the Scottish Coastal Forum's participation in AGMACS and the Scottish Marine Bill. All these actions emphasize the imperative need for an integrated coastal zone management framework that could accommodate competing and conflicting uses which share the same areas or resources in the UK.

One of the management tools there is a lot of discussion about is the Local Coastal Partnerships (LCPs). LCPs are non-statutory organizations and they have been in existence in a number of forms in Scotland since the early 90's (The Scottish Parliament, January 2007). Their actual role is to form local networks which allow for the information flows and enhance stakeholders' contribution and participation to decision-making processes related to coastal resources management. One of the biggest impediments, however, on their action is the long-term financial support. According to The Scottish Parliament (January 2007), "national policy objectives require delivery mechanisms and the LCPs are well-placed to respond to assist with the implementation of initiatives such

as Local Biodiversity Action Plans, the Water Framework Directive and the forthcoming Inshore Fisheries Groups (IFGs)". Therefore, it would not be surprising if LCPs gathered more power in the foreseeable future and were the main delivery mechanisms of the forthcoming Scottish Marine Bill. There are already LCPs that are quite activated in their geographical areas; one of these is "The East Grampian Coastal Partnership".

The East Grampian Coastal Partnership

The East Grampian Coastal Partnership (EGCP) was set up in June 2005 with the aim of assisting in the delivery of Integrated Coastal Zone Management (ICZM) (The Scottish Parliament, 2003-2007). Its role is multidimensional; protection of the coastal resources, cultural heritage and identity, actions for the benefit of the local communities and local tourism, engagement of local stakeholders in coastal issues decision-making, organization of information networks, seminars and research activities in the area and cooperation with other forums, such as the Scottish Coastal Forum, for the development and implementation of Integrated Coastal Zone Management projects. It could be argued that EGCP act as a local nucleus promoting sustainable development in the area based on the three pillars of sustainability; economic, social and environmental.

On the whole, it is believed that LCPs role is quite promising in the future, an argument which is in agreement with the SCF's Action Point for AGMACS. According to this Action Point, SCF proposes "dividing Scotland's coast into eleven units, mostly based on existing Local Coastal Partnership areas but encompassing local authority boundaries where these provide a better 'fit' for a more integrated outcome" (Scottish Executive, December 2006). Another interesting point in this report is that, according to calculations, the annual funding of the 11 proposed LCPs is potentially one-tenth of figures suggested for the annual running of one Coastal and Marine National Park.

5.3 Nationally Important Marine Features

It is considered important to refer to a kind of 'growing' term used in environmental management practices; Nationally Important Marine Features (NIMFs). According to Hiscock (2007), the application of NIMFs to identify candidate biotopes and species and their incorporation into decision making for marine environmental management and protection presents potentially new approaches to marine biodiversity priorities for action.

NIMFs are defined by Connor et al., (2002) as:

- Areas that best represent the range of seascapes, habitats and species present in the UK – the UK's marine biodiversity heritage.
- Seascapes, habitats and species for which we have a special responsibility in a national, regional or global context.
- Seascapes, habitats and species that have suffered significant decline in their extent or quality, or are threatened with such decline, and can thus be defined as being in poor status.

Defra (July 2004) classifies four refined criteria for identification of priority marine features:

1. *Proportional Importance*, which is divided to "Globally important" and "Regionally important";
2. *Rarity*, which is assessed as a feature which occurs in fewer than 0.5% of the total number of 10km x 10km squares in UK waters;
3. *Decline*, which can be an observed, estimated, inferred or suspected significant decline in numbers, extent or quality of a marine landscape, habitat or a species in the UK
4. *Threat of decline*, when it is estimated, inferred or suspected that the feature may suffer significant decline in the foreseeable future as a result of human activity, taking into consideration sensitivity, vulnerability and probable exposure to the effects of human activity.

It looks as if NIMFs will be on the centre of study and research in the next years and will form the basis for coastal and marine protection and management. The UK list of NIMFs is currently under consideration and it is possible that NIMFs will be given a legal status so that they are properly taken into consideration in planning and decision making processes (Wildlife and Countryside LINK, September 2005).

Therefore, it would not be surprising if NIMFs are incorporated in the future Scottish Marine Bill and LCPs are the competent authorities to provide them with the proper sustainable management in the UK environment network.

6 Qualitative research

This chapter focuses on the conduction of interviews for gaining a better knowledge of the area and the ethical implications of this qualitative research.

For the purpose of this thesis 5 interviews were carried out. The questionnaire consisted of 10 open-ended questions which are presented further below. The reason for the realization of the interviews was to track down the opinions and views of different stakeholders and gather qualitative data which are incorporated in the MCDA based on the triangulation method. The interviewees were chosen according to their background so that the most important stakeholder groups were represented. All interviewees agreed to being mentioned by their names and the stakeholder group that they represent. According to the date interviewed, starting from the earliest one, the interviewees are cited below:

1. Mike Balmforth (British Marine Industries Federation);
2. Rhona Fairgrieve, (Scottish Coastal Forum);
3. Shona McConnell (Marine and Coastal Development Unit, Argyll and Bute Council);
4. Patrick Stewart (Clyde Fishermen Association); and
5. Calum Duncan (Marine Conservation Society)

Mr Balmforth is secretary of the British Marine Industries Federation. The BMIF is the trade association for the British boating industry and is interested in marine spatial planning possible to resolve potential conflicts with fish farming. Ms Rhona Fairgrieve, is Officer of the Scottish Coastal Forum; the Forum was established by the Scottish Government to encourage debate on coastal issues at national level and provide advice. Ms McConnell is Marine and Coastal Development Officer in the Marine and Coastal Development Unit of the Argyll and Bute Council. Mr Stewart is the secretary and

treasurer of the Clyde Fishermen Association while Mr Duncan is the Scottish conservation manager of the 'Marine Conservation Society'; a UK charity organization dedicated to caring for UK's seas, shores and wildlife Therefore, Mr Balmforth could represent the sector of recreational activities, Mr Stewart the fishermen's group, Ms McConnell the local authorities point of view, Mr Duncan the environmental organizations' group and finally Ms Fairgrieve an organization established to take into account all the aforementioned opinions and care about the sustainability of all activities.

Triangulation method

The triangulation method has its roots in social sciences and usually "refers to the use of more than one approach to the investigation of a research question in order to enhance confidence in the ensuing findings" (Bryman, 2007). The concept of triangulation lies on the argument that when the produced results of a study are confirmed by two or more methods (double- or even triple- checking), the results are considered to be more reliable. When one research method is used for a particular study the limitations and maybe uncertainties are more than when at least one more method is used. Denzin (1970, as mentioned by Bryman, 2007) specified four types of triangulation:

1. *Data triangulation*, wherein data gathering is realised through several sampling strategies; there could be data produced at different times, social situations or even on different people;
2. *Investigator triangulation*, wherein gathering and interpretation of the data is realised by more than one persons working in the field;
3. *Theoretical triangulation*, wherein more than one theoretical positions are used for the interpretation of data; and
4. *Methodological triangulation*, wherein more than one method is used for data gathering. This type of triangulation, which is also the most common one, is used in the current study. As Bryman points out (2007) "Methodological triangulation" is often used to express the combined use of quantitative and qualitative research.

Questionnaire

The questionnaire used for all the interviews is cited below.

1. What is, in your opinion, the most economically important activity/ activities in the “Argyll Islands and Coast” area? Why? Explain.
2. What is, in your opinion, the most important threat for the coastal and marine environment of this area?
3. What changes do you believe that the designation of the Coastal and Marine National Park will have in the area?
4. Why do you think this area might be suitable for designation of a Coastal and Marine National Park?
5. How could a Coastal and Marine National Park help communities develop in a more sustainable way?
6. Do you think protection measures (for example, geographical and/ or temporal zonation) for the CMNP are needed? Yes/ No? What kind of measures?
7. Do you think fisheries should be managed in the designated area? How?
8. What do you think will happen if, as a result of the designation of the CMNP, visitors double in the area?
9. What do you think should be the function of the Park Authority?
10. Should the locals be involved in the Park management? Why? How?

A summary of the answers of the interviewees is presented in Appendix 2. Additionally, some of the opinions of the interviewees are used in the last stage of the MCDA during the sensitivity analysis.

Ethical implications of research

This thesis is aligned with the ‘*The Ethics policy*’ of the School of GeoSciences of the University of Edinburgh. Before the conduction of the interviews a Preliminary Ethics Self-Assessment Form was completed and handed to the two dissertation supervisors (Dr Graham Russell and Dr. Katherine Begg). The Ethics form is presented in Appendix 3.

7 Multi-Criteria Analysis (MCA)

This chapter introduces the reader to the MCA technique and compares it in brief with Cost-Benefit Analysis (CBA). All stages of the methodology used -Multi-Criteria Decision Analysis (MCDA) - are described in detail. The model is applied to the area under consideration and interesting results are derived. The chapter closes with the discussion of the results.

Multi-Criteria Decision Analysis (MCDA) belongs in the group of Multi-Criteria Analysis (MCA) techniques. MCA is a formal planning methodology; it is used as a means of simplifying complex decision-making tasks which may involve many stakeholders and decision-makers, a diversity of possible outcomes, and many and sometimes intangible criteria by which to assess the objectives.

Edward-Jones *et al.*, (2000) point out that MCA is not an alternative procedure to project appraisal techniques, such as Cost-benefit Analysis (CBA) or Environmental Impact Assessment (EIA); it provides a formal structure for integrating the knowledge and results from these approaches so that decision-makers choose that option that fits best with their planning priorities.

The first form of this technique was Multi-Criteria Decision Making (MCDM) and has its roots back in 1974. However, this form has evolved so that it could be used by decision makers to deal with a variety of problems. Some of its more recent branches are Multi-Criteria Decision Aid (MCDA), Multi-Criteria Decision Support (MCDS), Multi-Criteria Objective Decision Making (MODM) and Multi-Attribute Decision Making (MADM). All these techniques are known as Multi-Criteria Analysis (MCA) (Edwards-Jones *et al.*, 2000). Given all these different forms of MCA, there is no specific, strict procedure that one should follow in order to carry out an MCA.

Benefits and Drawbacks of an MCA

MCA has advantages and disadvantages when compared to other techniques. It is important to mention that MCA techniques characteristics could be considered both benefits and drawbacks if seen from a different point of view.

One of the method's major advantages is that when applying an MCA the aspects are usually not expressed in monetary terms. In Cost-benefit Analysis, for example, there are three indicators that are calculated according to all costs and benefits being expressed in monetary terms; the Net Present Value (NPV), the IRR (Internal Rate of Return) and the Benefit-Cost Ratio (BCR). More specifically, if the NPV is positive or the $BCR > 1$, then the project is economically viable and thus, worthwhile. So, depending on these values, it is derived whether a project should go forward or not. Expressing everything in monetary terms means that all aspects under consideration can be valued. However, when it comes to social and environmental aspects this "valuation" is not always possible and often results to inaccuracies and uncertainties. MCA does not presuppose that all criteria should be expressed in monetary terms; it is possible but not necessary. This freedom in data-collecting makes MCA more flexible, open and explicit. Moreover, MCA is offering the option of introducing qualitative data which in many cases is quite useful. Decision-makers are frequently facing problems with the availability of quantitative data; therefore, qualitative data might solve this problem. Another advantage of MCA techniques is that the objectives and criteria chosen by the decision making group are open to analysis and change if they are felt to be inappropriate (DETR, December 2000). Moreover, MCA is a participatory process; usually there is a decision-making team which makes sure that all stakeholder groups interests are represented and taken into consideration.

On the other hand, the fact that MCA techniques are dealing with what may be considered 'incommensurable properties' -properties that do not operate under a common measure or standard- may be an essential drawback. As a result, the judgement of the options and the criteria is subjective and this introduces uncertainties or even assumptions. However, this contributes to the resolution of the problem under

consideration and not to a general judgement of whether a project is economically viable. In conclusion, all techniques have both advantages and disadvantages. In the current thesis, MCA was chosen because it was considered more suitable than other techniques. MCA techniques are used for a number of reasons; they can reveal a single most preferred option, rank options or simply make a distinction between acceptable from unacceptable options.

7.1 Multi-Criteria Decision Analysis (MCDA)

In the current thesis, Multi-Criteria Decision Analysis (MCDA) is implemented. During MCDA, the decision making group is required to score the criteria under the identified options; a process known as 'scoring'. The scoring in the current thesis is realized through the 'relative preference scales' method. According to this method, each criterion is assigned a particular score under each option in a scale extending from 0 to 100. The most preferred option, which is the most liable to give the best performance under the chosen criteria, is assigned a score of 100 and the least preferred option is assigned a score of 0. The rest options are assigned scores in between, proportionally, so that their differences reflect differences in preference (Defra, 2002).

However, even after scoring the preference scales still can't be combined; this is due to the fact that "a unit of preference on one does not necessarily equal a unit of preference on another" (DETR, December 2000). Therefore, criteria should be weighted so that their importance in decision making is reflected. In the current thesis, the method of "swing weighting" was used. The swing method uses comparisons between the differences in scales; more specifically, "how much does the swing from 0 to 100 on one preference scale compare to the 0 to 100 swing on another scale" (DETR, December 2000). To compare these different scales one needs to take into account two aspects: the difference between the least and the most preferred option and how much this difference matters.

Firstly, one should identify the criterion with the biggest swing in preference from 0 to 100. As MCDA is a participatory process, these weights should be the results of stakeholders groups' opinions. The next step includes the assignment of a weight of 100 to this criterion and from this point forward the criterion becomes the standard to which all else criteria are compared. If, for example, a criterion is judged to represent one third the swing in value as the standard, then it should be assigned a weight of 30. Finally, after all stakeholders views are taken into account, the decision maker or the decision making group determines the final weight for the criterion. Despite the fact that the MCDA process is participatory, there is always a decision making group who decides on the final weights. The decision making group may consist of both experts in MCA techniques and representatives of major stakeholders. Sensitivity analysis, which constitutes the last stage of MCDA, is carried out based on the outcomes of the interviews. In the current thesis the HView software is used for the accomplishment of the MCDA.

7.2 MCDA stages

Multi-Criteria Decision Analysis involves eight (8) stages:

1. Establishment of decision context;
2. Identification of options;
3. Identification of criteria;
4. Scoring;
5. Weighting;
6. Combination of the scores and weights for each of the options;
7. Examination of results; and
8. Sensitivity analysis.

These stages are analyzed below. As part of the process of quality assurance, all judgments are justified in the proper part of the text.

7.3 MCDA on Marine Park in Argyll Islands and Coast

7.3.1 Establish decision context

This stage includes the aim of the MCDA and identification of stakeholders and other key players for the establishment of the Coastal and Marine Park. For that purpose, the administrative, political and social structures that are related to the decision being made have to be defined (DETR, December 2000). Furthermore, there should be a clear understanding of the objectives as during the analysis some trade-offs are inevitable. In this thesis, the decision context is the research on the form of the Marine Park which should be adopted in Argyll Islands and Coast. The stakeholders that are affected by this designation are the following:

- Local people;
- Fishermen;
- Aquaculture sites owners and people employed in these sites;
- People employed in tourism- related or recreational activities-related businesses;
- Tourists (for example, sailors and divers); and
- Local authorities (for example, the Argyll and Bute Council).

Central to the decision context are the objectives of the decision making body (DETR, December 2000). The current approach is focused on the sustainable livelihood of the local communities that live on or by the designated area in question. The current analysis constitutes a short-term approach -for the next 10 years. In order this analysis to be applicable for a longer term further issues need to be taken into consideration.

7.3.2 Identification of options

It is important in this stage to identify alternative courses of action that can satisfy the aim of the study under consideration.

A set of four options which frame the MCDA is explored in the current thesis. For the sake of neutrality of language the four options are named 1, 2, 3 and 4. The options, which are cited below, explore the role of increased tourism and the effect of restricting current fishing of scallops (scallop dredging) and trawling. Options have included Status Quo for comparison.

Description of decision options

Option 1.

Status quo; no fishing restrictions, no proactive procedures, tourism expected to be increasing but not at a big rate; the increase of tourism is set at a rate of 2% per year.

Option 2.

Designation of the Coastal and Marine National Park, with no fishing restrictions and no proactive procedures.

Option 3.

Designation of the Coastal and Marine National Park, with no fishing restrictions and proactive procedures.

Option 4.

Designation of the Coastal and Marine National Park, with fishing restrictions and proactive procedures.

There are several reasons for choosing these decision options. Firstly, tourism is one of the most economically important activities in Argyll Islands and Coast; according to the majority of the interviewees, (4 out of 5), it is the most important income-generating activity in the case study area. Moreover, again based on the interviews made, it is quite possible that the designation of the CMNP will lead to the honey pot effect. Therefore, tourism and its possible increase after the designation of the Park were considered necessary to be included in the design options.

During the study of already designated Marine Parks around the world, some of which are mentioned in Chapter 1, it is obvious that restrictions at least in some parts of the designated region should apply. Therefore, it was considered important to include restrictions and the absence of restrictions in the decision options. The reason for choosing scallop dredging and trawling is because these are considered to be the most harmful fishing activities in the area under consideration in terms of fishing. Moreover, since in south-west Scotland fleet mostly fishes for shellfish and benthic species, scallop dredging and trawling is considered to be another economically important activity –apart from tourism- in the area. Therefore, the aforementioned fishing activities were considered to be necessary for integration in the decision options.

Finally, there are also many reasons for deciding to include proactive procedures in the decision options. The designation of the Coastal and Marine National Park is a novelty for Argyll Islands and Coast. consequently, there should be a preparation stage which will focus on raising local awareness on the environmental benefits which stem from the designation of the Park. Moreover, proactive procedures also include education strategies on the value of the environmental and social aspects of the area under consideration. As a result of these strategies, locals will appreciate more the environmental features of their area and will feel that there is need for a better management of all the activities that affect the coastal and marine resources.

Enhanced local involvement in decision-making and participatory planning is another important aspect of proactive procedures; if the local community is included in the decision making, it will feel responsible for the decisions taken and will better accept the designation of the Park even if it not in full agreement with it. Lewis (2001) and Mitchell (2001) (as cited by Fallon *et al.*, 2003) argue that “community involvement and ownership from the onset of a development helps to ensure its long-term success”.

Restrictions in scallop dredging and trawling will lead to the loss of some jobs in the area; therefore, part of the proactive procedures should be the implementation of education strategies and investment on alternative, more “environmentally friendly” ventures, such as ecotourism activities and activities related to local culture. Furthermore, compensation actions should be implemented in any cases that this is considered necessary.

Assumptions used in the MCDA process

Given the fact that there is no final model specified for the Park, it is necessary to cite the assumptions and uncertainties which surround the MCDA model. These are cited below:

1. The CMNP boundaries will not extent further to Scotland’s territorial waters (within 12 nautical miles of the coast);
2. The Park Authority will produce a Park Plan which will provide the necessary framework for all activities taking place within the CMNP;
3. The Park Authority will not have regulatory functions in relation to ports and harbours activities and related consents to shipping;
4. Tourism under Option 1 (Status Quo) will increase by a small percentage such as 2% per year. On the contrary, tourism under Options 2, 3 and 4 will increase by a percentage of 50% within 10 years as a result of the CMNP designation and the honey pot effect; and
5. Tourism increase by 50% within the next 10 years under Options 2, 3 and 4 will result in the increase of pollution.

Uncertainties

1. Climate change and its associated consequences pose an important threat for the environment and may harm marine organisms’ populations and diversity. For example, climate change could be responsible for the collapse of bird species. As a result, this factor is not considered in the current thesis.

2. It is worth mentioning that there is big uncertainty related to the data found. Assumptions needed to be made as data availability was small and often concerning a wider area than the actual case study area. The calculations made to derive illustrative numbers for the case study area contain uncertainties.

Before going on with the description of the third step of the MCDA, it is important to mention that the current research is only an illustrative example of how these options can be compared and that the author's personal views have been encoded. In reality, local participation would be mandatory for the implementation of the MCDA.

7.3.3 Identification of criteria

This stage is probably the most critical stage of the MCDA. The criteria are the performance measures by which the area -Argyll Islands and Coast- will be evaluated. They must satisfy the objectives of the MCD and are the measurable features of the planning environment, which, either singly or together, indicates the levels of objective achievement (Edwards - Jones *et al.*, 2004). During the process of choosing the appropriate criteria, a number of guidelines should be followed (Keeney and Raiffa, 1993). Therefore, it is important that the chosen criteria are operational; so, after choosing them, one should be able to answer how well the chosen option performs on these criteria.

The criteria used in the MCDA were chosen according to the author's personal opinion, discussion with the supervisors and literature review studied. As mentioned above, if this was a real-state situation, the normal process would include visits to local people and the process of scoring and weighting criteria would be done in consultation with stakeholders. This is because the nature of MCDA is participatory and stakeholders are part of the decision making process.

Objectives

1. Ecosystem services
2. Viable local communities

Definition of objectives

Ecosystem services

‘Ecosystem services’ is an all-embracing term. One, for example, could argue about loss of biodiversity but about degradation of ecosystem services. “Sustainable development rests on three pillars — society, economy and environment. The environmental pillar provides the physical resources and ecosystem services on which humankind depends” (UNEP, 2002). Ecosystem services could be *provisioning* services such as water, food, wood and timber, fuel or even be more complicated and *regulating* such as climate regulation, flood regulation, disease regulation and water purification. “These services are so fundamental to life that are easily taken for granted and so large in scale that is hard to imagine that human activities could destroy them” (Ecological Society of America, Summer 2000).

Viable local communities

‘Viable local communities’ is another broad objective. It is linked to income-generating activities and social acceptability of the local people. Argyll Islands and Coast is facing depopulation and the current population is ageing and more affluent than the national average (Scottish Executive, 2006). Therefore, it is necessary to examine the effect of the designation of the CMNP in local business and its potential on creation of new businesses. Moreover, remote communities in Scotland and especially in Argyll Islands and Coast have a strong culture. This is also confirmed by the information gathered from the interviews made. Therefore, the level of social acceptance of the CMNP and the associated changes that it brings is a very important factor. Consequently, viable local communities could be possibly defined as economic development taking into account social factors.

Each objective is characterized and further identified by a group of criteria. More specifically, the first objective, “*Ecosystem services*”, which is focused on the maximization of the sustainability of ecosystem services in the designated area of the CMNP, is defined by four criteria (Figure 27):

- marine mammals; maintenance and increase in population and diversity in marine mammals
- fish; maintenance and increase in population and diversity in fish
- birds (both resident and migratory); maintenance and increase in population and diversity in birds and
- other marine species; maintenance and increase in population and diversity in other marine species.

The second objective, “*Viable local communities*”, is focused on the viability of local communities depending on the CMNP and their acceptance to changes to access and new opportunities in line with their culture; it is characterized by the following two criteria (Figure 28):

- local business; and
- preservation of local culture

Objective 1: Ecosystem services

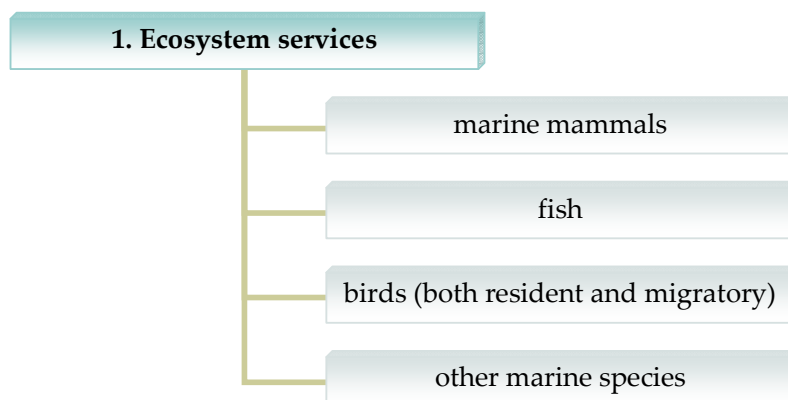


Figure 27. Diagram showing the criteria of the first objective; ecosystem services

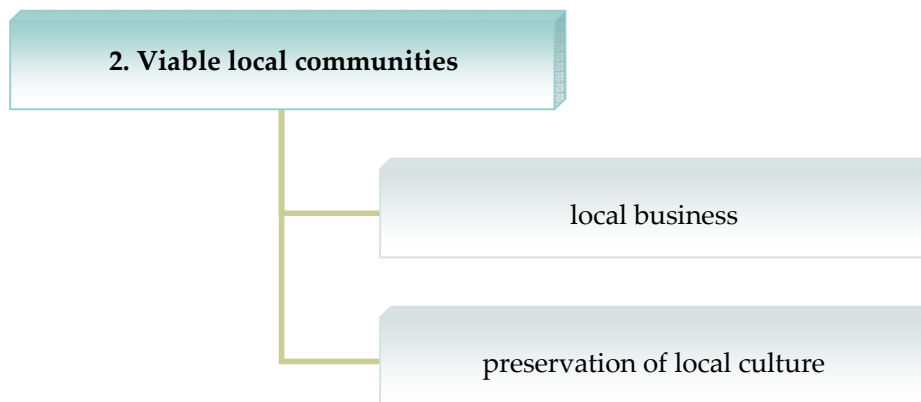
Objective 2: Viable local communities

Figure 28. Diagram showing the criteria of the second objective; viable local communities

At this point, it is necessary to state that there is one important criterion that could not be integrated in the MCDA model as it was not operational; this criterion is the financial costs associated with the designation of the CMNP.

“Financial costs” is a very important chapter for the designation of the CMNP. Set-up, running and monitoring costs are required. Enforcement costs are also necessary since there is no use “designating” an area without making sure that all decisions and restrictions are implemented. In a real-state situation, these costs should be included in the MCDA assessment. However, in this case there are problems related to the fact that it is very difficult to get some meaningful figures for these costs; this happens because if one excludes option 1 (status quo), all other option are expected to behave in a quite similar way in terms of costs. The latter factor in combination with the absence of possible costs’ data leads to the omission of financial costs from the MCDA. Finally, it could be argued that financial costs are only a part of costs and benefits produced by the designation of the Park; as it is already mentioned before, this case study is only an illustrative example which explores some of the total costs and benefits of the Park. It is important to state, though, the only figures found in the literature review for financial costs. According to Scottish Executive (December 2006), the annual funding of the 11 proposed LCPs was

calculated to be one-tenth of figures suggested for the annual running of one Coastal and Marine National Park.

The objectives and criteria identified are depicted in a hierarchical way in the form of a 'value tree' (Figure 29). This way of structuring the objectives and criteria facilitates the process of assigning scores and weights which are realised in the following steps of the MCDA.

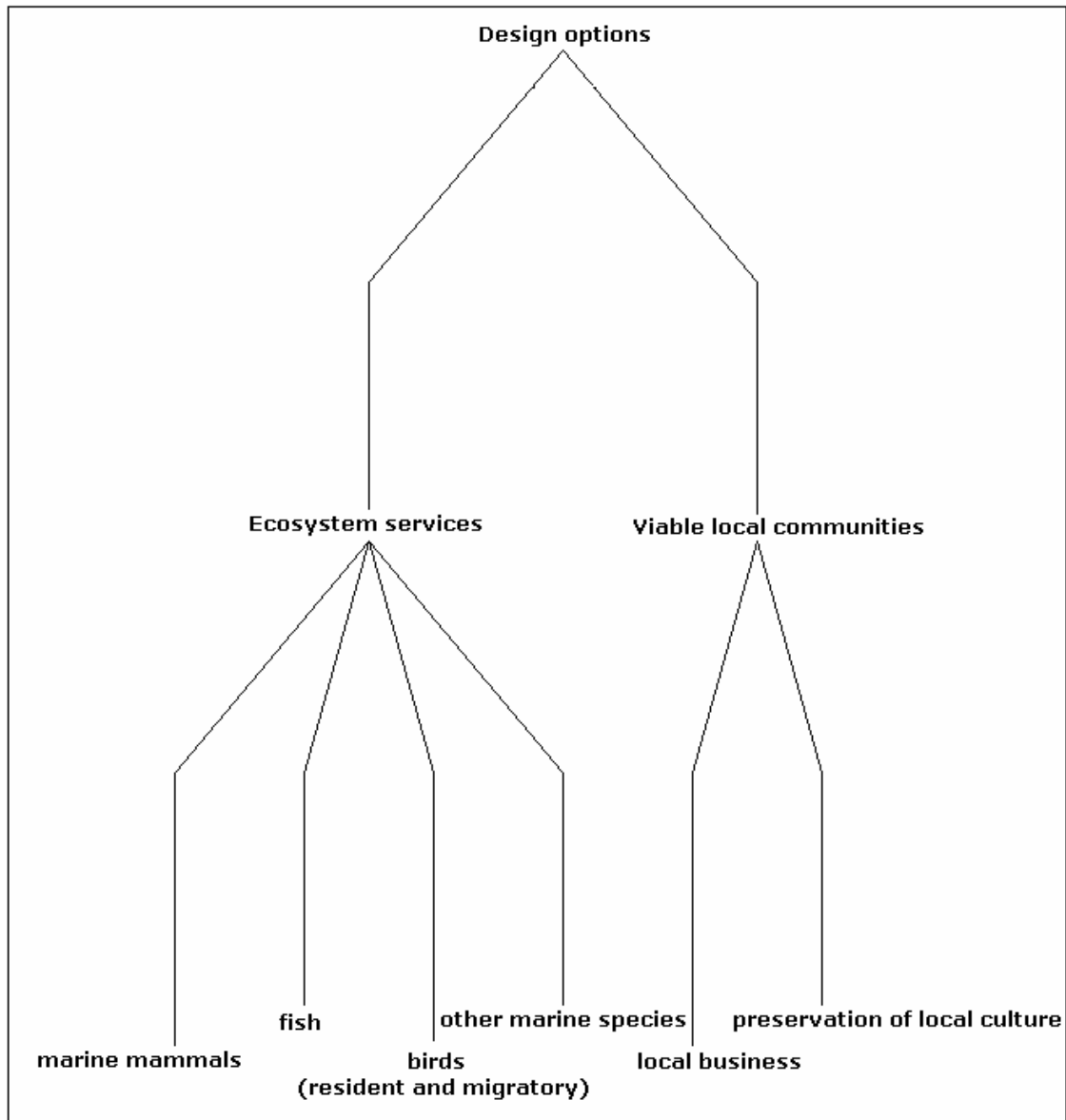


Figure 29. Value tree of the MCDA on the Marine Park in 'Argyll Islands and Coast'

7.3.4 Scoring

This is a quite important stage which includes descriptions of the expected performance of each option against the criteria used and 'scoring' of options. The 'scoring' of options is realized through the "relative preference scales" method. The most preferred option is assigned a weight of 100 while the least preferred option is assigned a weight of 0. The scores assigned on each criterion are presented below. The assignment of the specific scores on each criterion is justified. To facilitate the reader's understanding, the four options are presented again below:

Option 1.

Status quo; no fishing restrictions, no proactive procedures, tourism expected to be increasing but not at a big rate; the increase of tourism is set at a rate of 2% per year.

Option 2.

Designation of the Coastal and Marine National Park, with no fishing restrictions and no proactive procedures.

Option 3.

Designation of the Coastal and Marine National Park, with no fishing restrictions and proactive procedures.

Option 4.

Designation of the Coastal and Marine National Park, with fishing restrictions and proactive procedures.

Scoring on Ecosystem services' criteria

- Criterion 1: Marine mammals

Options	Scores
1	15
2	0
3	30
4	100

Table 14. Assignment of scoring on 'marine mammals'

In the criterion "Marine mammals", option 2 is assigned a score of 0 (Table 14) and is the least preferred, while option 4 is assigned a score of 100 and is the most preferred. Under option 2, there are no fishing restrictions and no proactive procedures to control pollution resulting from the big increase in tourism; therefore, under the 'no fishing restrictions' argument the environment remains in a stable status, but given the increase in tourism there is a degradation of the environment taking place. Because of these reasons, option 2 is the least preferred for marine mammals' sustainability.

Option 4 is the one liable to perform better for marine mammals. The combination of restrictions and proactive procedures will result in the improvement of marine life on the whole. Moreover, proactive procedures will be concerned with the management caused by increased tourism.

Option 1 -the Status quo- is not expected to cause a big change in the state of marine mammals. The tourism increase is only 2% per year; therefore, the pollution levels will be low. However, the absence of proactive procedures under this option, leads to its assignment of a low score; 15.

Option 3 would make some difference in marine mammals' state because of the presence of proactive procedures, which would manage the pollution impacts on the environment. However, the improvement would not be that big as there are no fishing restrictions.

Overall, option 4 scores higher for marine mammals. Option 3 is preferred at a rate of one third ($1/3$) of option 4, while option 1 is preferred at half ($1/2$) the rate as option 3.

• Criterion 2: Fish

Options	Scores
1	10
2	0
3	10
4	100

Table 15. Assignment of scoring on 'fish'

In the 'Fish' criterion, again option 4 is assigned a weight of 100 and option 2 a weight of 0 (Table 15). Option 4 is the most preferred because fishing restrictions will protect and conserve fish population and biodiversity. Moreover, pollution levels will be managed by proactive procedures so that fish status is not degraded because of the tourism increase.

Under option 2 there are no fishing restrictions; therefore, fish status, and the marine environment in general, will deteriorate as there are also no proactive procedures to control pollution caused from tourism.

Option 1 is again not expected to make much of a difference on fish. Pollution levels will be low as tourism increase will be small. The absence of proactive procedures makes this option not preferred.

Fish populations will be negatively affected by option 3. The tourism increase, resulting to pollution increase, in combination with no fishing restrictions will probably lead to the

degradation of fish status. Proactive procedures which contribute to the education of people are not expected to make much of a difference by themselves. In this option, further research is needed to investigate the power of proactive procedures and their ability to influence locals' and tourist's behaviours.

Overall, option 4 scored higher for fish as well. Both options 1 and 3 are preferred at a rate of one tenth (1/10) when compared to the most preferred option; option 4. At this point, it is worth-noticing that option 3 performs equally well with the status quo for the 'fish' criterion.

- Criterion 3: Birds

Options	Scores
1	20
2	0
3	10
4	100

Table 16. Assignment of scoring on 'birds'

Option 4 is again the most preferred one (Table 16). The combination of proactive procedures and fishing restrictions are positive conditions for birds' status as well. Fishing restrictions lead to the protection of fish populations which affects birds' populations positively, as they mainly feed on fish. The area under consideration also hosts migratory birds which stop in the area in order to rest and refuel during migration; therefore, the protection of fish populations is quite crucial for birds' status. Finally, pollution levels will be controlled by proactive procedures.

Option 2 is again the least preferred option, which is the reason why it is assigned a weight of 0. The combination of no fishing restrictions and no proactive procedures affects birds in a negative way. Uncontrolled pollution levels affect birds' populations in two ways; directly, as one of the most common ways that seabirds are killed is when

swallowing garbage, such as plastics or nets and indirectly, as fish populations are degraded and in this way birds' population are degraded as well. One could argue that if it was only for no fishing restrictions, the current status of the marine environment could be stable, as there is already some kind of zonation. However, when increased levels of pollution are added and there is no proper management plan, then the impact of this option to birds is clearly negative.

Option 1 is assigned a score of 20. The small increase in tourism, resulting to a small increase in pollution levels under this option, is not expected to cause a major change in the current birds' status. The reason for this is because there are already 9 SPAs in the case study area designated under the Bird's Directive. Therefore, one could argue that there is already some kind of management that contributes in the protection of bird species, while a 2% per year increase in tourism will not change much the current conditions.

Option 3 is assigned a weight of 10. No fishing restrictions and increase in tourism will harm bird's populations for the reasons mentioned above. Proactive procedures are expected to contribute in people's education; however, education strategies by themselves are not expected to offset the impacts caused by fish populations' degradation. It should also be pointed out that further research needs to be done on the influence that these procedures may have in the people's behaviour.

Overall, option 4 is again the most preferred option while option 2 is the least preferred one. Option 1 is preferred at a rate of one fifth ($1/5$) as option 4, while option 3 is preferred at half ($1/2$) the rate as option 1. It is remarkable that for the 'birds' criterion, the status quo (option 1) performs better than one of the suggested options; option 3. That is to say, that it is better for bird species not to designate the CMNP under the conditions of option 3.

- Criterion 4: Other marine species

Other marine species are expected to behave in similar ways such as the rest of species. In this category all other marine organisms, apart from the ones already mentioned above, are included. Given the fact that all marine organisms form successive levels of predation in a food chain, other marine species are equally important as the rest of the organisms.

Options	Scores
1	30
2	0
3	10
4	100

Table 17. Assignment of scoring on 'other marine species'

Therefore, option 4 is again the most preferred option and is assigned a weight of 100 (Table 17). The combination of fishing restrictions and proactive procedures contribute to the protection and conservation of these species populations. Proactive procedures in terms of managing pollution levels contribute to other marine species health and, as a result, to the ecosystem health in general.

Accordingly, option 2 is the least preferred option for other marine species. Under the current option, there are no fishing restrictions; therefore the marine environment would be rather disturbed as there are no proactive procedures to control pollution levels from increased tourism.

Option 1 is assigned a weight of 30 as a small increase in tourism is not expected to deteriorate much the status of the marine environment.

Finally, option 3 is not highly preferred as both fish' and birds' populations will be negatively affected because of the absence of fishing restrictions; as a result, populations and diversity of other marine species will be disturbed as well. Again proactive

procedures will have a positive effect, through management of pollution and education strategies, but further research should be carried out to explore the applicability of the latter.

Overall, the most preferred option is again option 4 and the least preferred one is the option 2. When compared to option 4, option 1 is preferred at a rate of about one third (1/3) while option 3 is preferred at a rate of one tenth (1/10). It is again worth pointing out that the current situation (option 1) is preferable for other marine species than option 2.

On the whole, the 'Ecosystem services' objective scores higher under option 4 (Table 18). It is worth mentioning that none of the other options, apart from option 4, performs better than the status quo (option 1).

Options	Scores				
	Marine mammals	Fish	Birds (resident and migratory)	Other marine species	Total scores of options
1	15	10	20	30	75
2	0	0	0	0	0
3	30	10	10	10	60
4	100	100	100	100	400

Table 18. Total scores of options for 'Ecosystem services'

Scoring on Viable local communities' criteria

- Criterion 1: Local business

Options	Scores
1	0
2	70
3	100
4	55

Table 19. Assignment of scoring on 'local business'

In the criterion 'Local business', option 3 is assigned a weight of 100, which implies that it is the most preferred option, while option 1 is assigned a weight of 0, indicating that it is the least preferred one (Table 19). The designation of the CMNP leads to a big increase in tourism; as a result there is the potential for expansion of already existing businesses and the opening of new ones, in terms of new businesses generation and promotion prospects. These could be related to ecotourism practices which would be launched by the operation of proactive procedures. Moreover, there are no fishing restrictions, therefore, no closing down of businesses relates to fishing.

Option 1 is the least preferred option. The case study area is currently facing depopulation and the population is ageing, declining and more affluent than the national average (Scottish Executive, 2006). These conditions express the imperative need for the development of the area in terms of employment potentials.

Option 2 is highly scored at a rate of 70; this is because the big increase in tourism results in the expansion of already existing jobs and the absence of fishing restrictions will not affect the operation of already existing jobs in fishing and fish-processing sectors.

Finally, option 4 is scored at 55; the designation of the CMNP will result in increased tourist numbers which contribute to local business generation in the area in terms of new initiatives and practices. Proactive procedures will focus on the introduction and implementation of these new initiatives. However, fishing restrictions are expected to harm the fishing-related employment sector. At this point, it is important to state, that there is uncertainty on if or how proactive procedures could offset the negative impact produced on local business by the prohibitions on fishing. Consequently, further research needs to be done in order to explore the performance of proactive procedures.

Overall, option 3 is the most preferred one while option 1 is the least preferred one. Option 2 is preferred at a rate of about two thirds (2/3) and option 4 about half the rate

when compared to the most preferred option; option 3. It is worth pointing out that for local business generation, the status quo (option 1) is the least preferred option.

- Criterion 2: Preservation of local culture

Options	Scores
1	60
2	0
3	100
4	15

Table 20. Assignment of scoring on 'preservation of local culture'

For the criterion 'Preservation of local culture', option 3 is again the most preferred one (Table 20). The reason for this in that Argyll Islands and Coast is a traditionally fishing community; therefore, the absence of fishing restrictions contributes to the maintenance of their identity and culture linked to the fishing activities. Moreover, the existence of proactive procedures enhances and further preserves their local identity as their everyday practices and habits could be set under an ecotourism 'umbrella' and be sustainably marketed and therefore preserved.

Option 2 is the least preferred option for preservation of local culture. The combination of a big increase in tourism and absence of proactive activities is expected to have negative impacts on locals' culture.

Option 1 is relatively highly rated at 60; given the fact that there are no fishing restrictions and large influx of tourists, this option is considered to be good for local culture.

Finally, option 4 is low rates at 15; as already mentioned above, because the local community is traditionally being a fishing community, fishing restrictions would cause problems in culture-related issues. Again, proactive procedures would contribute to the preservation of the locals' culture. However, this issue is a challenge. It again depends on

whether proactive procedures could offset the negative impact caused by fishing restrictions. It is considered, though, that loss of fisheries would be more harmful than the positive effect produced by the proactive procedures.

Overall, the most preferred option is again option 3 while, now, the least preferred option is option 2. Option 1 (status quo) seems to perform well as it is preferred at more than half (60) the rate of the most preferred option. On the contrary, option 4 performs really badly, at a rate of about one sixth (1/6) when compared to option 3.

On the whole, the 'Viable local communities' objective scores higher under option 3. Options 2 and 4 are equally preferred, while option 1 is the least one preferred (Table 21).

Options	Scores		
	Local business	Preservation of local culture	Total scores of options
1	0	60	60
2	70	0	70
3	100	100	200
4	55	15	70

Table 21. Total scores of options for 'Viable local communities'

7.3.5 Weighting

The assignment of weights on each of the criteria will reflect their relative importance to the decision. Ecosystem services and viable local communities are the two objectives between which the major trade-offs will take place.

'Ecosystem services'

The most important criterion of 'Ecosystem services' was considered to be fish, as it is believed that the sustainability of all the rest criteria depends on it; fish are birds' and mammals' main food source. For this reason, if fish is assigned a weight of 100, the four criteria are rated in terms of importance as below:

$F > MM > B > OMS$

$100 > 70 > 65 > 65$ where,

F: Fish;

MM: Marine mammals;

B: Birds; and

OMP: Other marine species.

Marine mammals, birds and other marine species are also highly rated because the sustainability of ecosystem services depends on all these species. Marine mammals are rated a bit higher than birds and other marine species because several sites included in the case study area constitute important mammals' breeding colonies.

'Viable local communities'

The most important criterion of 'Viable local communities' is 'local business', because, in the current approach, emphasis is put on the existence of a stimulus for facing depopulation in the area. Therefore, the two criteria are rated as below:

$LB > PLC$

$100 > 70$ where,

LB: Local business; and

PLC: Preservation of local culture.

Preservation of local culture is also important and this is the reason why it is highly rated (70); however, the fact that young people are moving from the area to big city centres for employment reasons (information derived from interview with Mr P. Stewart) and that the population is ageing (Scottish Executive, 2006) leads to the prioritization of local business.

The approach of this thesis focuses on the viability of the local communities; therefore, more weight is given on local business. Consequently, local business becomes the standard and fish is judged against it as shown below:

LB>F

100>70 where,

LB: Local business; and

F: Fish.

7.3.6 Combination of the scores and weights for each of the options to derive the overall value

The overall value of the options is derived and these are ranked by their desirability. The overall value was calculated by a linear additive model, according to the equation cited below:

$$S_i = w_1s_{i1} + w_2s_{i2} + \dots + w_ns_{in} = \sum_{j=1}^n w_js_{ij}$$

where s_{ij} represents the preference score for option i on criterion j , w_j represents the weight for each criterion and S_i the overall score for each option.

The objectives are presented below in relative weights (Table 22).

Objectives	Weights
Ecosystem services	45
Viable local communities	55

Table 22. Relative weights on the objectives

The weights assigned above show that both objectives are important; 'viable local communities' is considered to be more important than ecosystem services, though. The justification for the assignment of these weights is that in the case study area there are already numerous sites which are protected under international and national directives and initiatives; a fact which implies that there is a kind of environmental management of the area. However, the current problem of depopulation and ageing population is not taken into consideration properly.

Additionally, 'ecosystem services' is also highly weighted because the viability of local communities is heavily dependent on marine resources. The most economically important activities in the area are considered to be tourism and fishing (information derived from interviews). Tourism is strongly related to the landscape aesthetic value, recreational activities such as sailing, boating and diving and marine mammals and birds' watching. Fishing sustainability is obviously related to the fish and all other marine species status, rates of extraction and water quality in terms of pollution. It is, therefore, obvious that the two criteria are strongly related to each other and that the importance of ecosystem services should not be ignored.

7.3.7 Examination of the results and conduction of sensitivity analysis

In general, examination of results and sensitivity analysis are two different stages of the MCDA. However, for better comprehension of the reader they are presented together.

The 'expected values' are presented in Figure 30. The term 'expected values' is a probabilistic term expressing the initial results that are produced by the model. These results should never be considered as the output of the model, as the model only allows an exploration of the decision to be made.

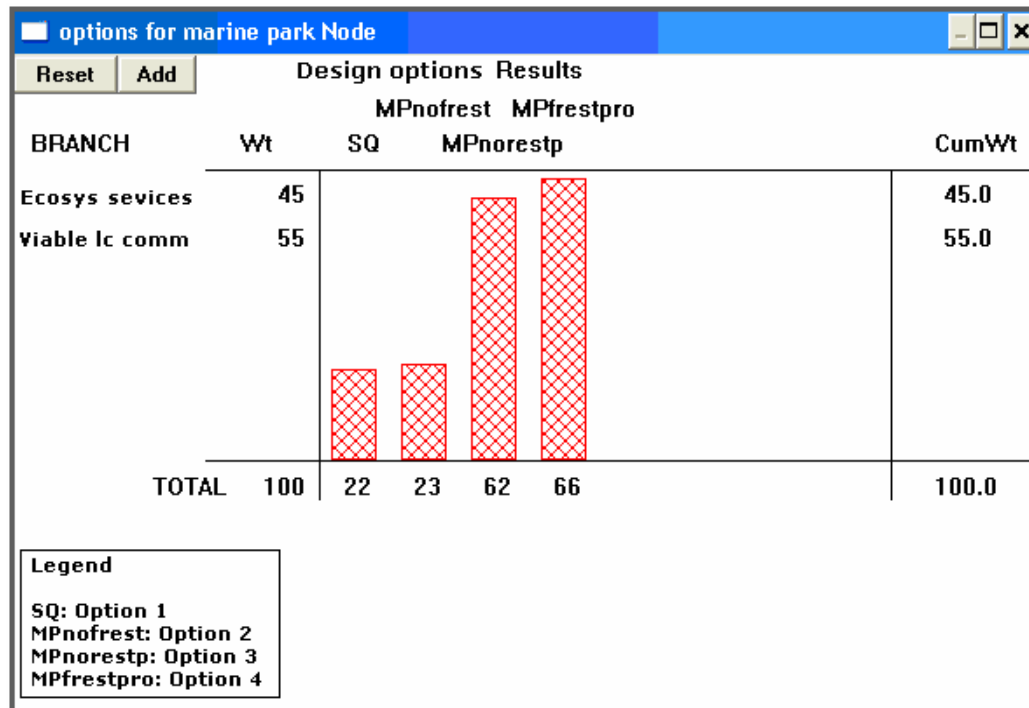


Figure 30. Initial results for the 'expected values' if the options

These initial results clearly show that options 1 and 2 are not highly preferred. However, they make no significant distinction between options 3 and 4. This could be due to the fact that there are uncertainties on the weight assigned on ecosystem services and viable local communities between which major trade-offs happen. Moreover, it is implied that the options under consideration are not good enough for the model to provide a specific preference. The current approach is simplistic and a much more detailed assessment is necessary. Local communities need to be examined in detail and probably further criteria should be added under the second objective; viability of local communities.

It is worth mentioning that in the beginning of the construction of the model, under the viability of local communities' objective there were 3 criteria: jobs, which was concerned with the impact on the number of jobs; local business, which was about creation of new and closure of old jobs and was focused on promotion prospects and a wider chance of possibility and quality of jobs; and preservation of local culture, as it stands in the current

model. However, there was double-counting taking place although the two first criteria were concerned with different issues; as no way was found of avoiding double-counting, 'jobs' and 'local business' were integrated to 'local business' as it currently stands in the model. In order for the two aforementioned criteria to stand by themselves further research on promotion prospects in the area is necessary.

Sensitivity Analysis

Sensitivity Analysis helps the decision making group to gain a better qualitative feel for the issue under consideration; therefore, it leads to increased confidence in taking a decision. A sensitivity analysis is conducted to examine the extent at which vagueness about the inputs or disagreements between people makes any difference to the final overall results (DETR, December 2000).

In the current analysis, no local input was taken into consideration. Consequently, this makes the processes of 'scoring' and 'weighting' sensitive to uncertainties and inaccuracies. In a real-state situation, local people would be asked to state their opinions and they could also be asked to participate in the actual MCDA by scoring and assigning weights on the identified options.

The purpose of the interviews made was to gain a better understanding of the area, gather qualitative data and record some of the major stakeholders groups' views. However, due to time restrictions, only 5 interviews were carried out. The number of the interviews is too small to be a statistical sample. Moreover, as interviews are quite subjective, it is not always easy to identify whether the interviewees are responding according to their personal views or representing the views of the groups in which they belong. Again, these facts create uncertainties, a fact that should be considered in the sensitivity analysis.

Additionally, it is argued that “more criteria decrease the lack of sensitivity during the analysis” (DETR, December 2000). Due to data limitations, only six criteria were identified in the current analysis. As a result, the analysis becomes more sensitive to inaccuracies.

Finally, a sensitivity analysis may reveal ways in which options might be improved or favored depending on the decision group’s priorities; these aspects are explored below.

Figure 31 depicts the current weight assigned on ‘Viable local communities’ as a red, vertical line; 55. Numbers on the right side of the diagram stand for the options studied. The weight given is at a crossover for two options; options 3 and 4. This denotes that the researcher should be indifferent between these two options.

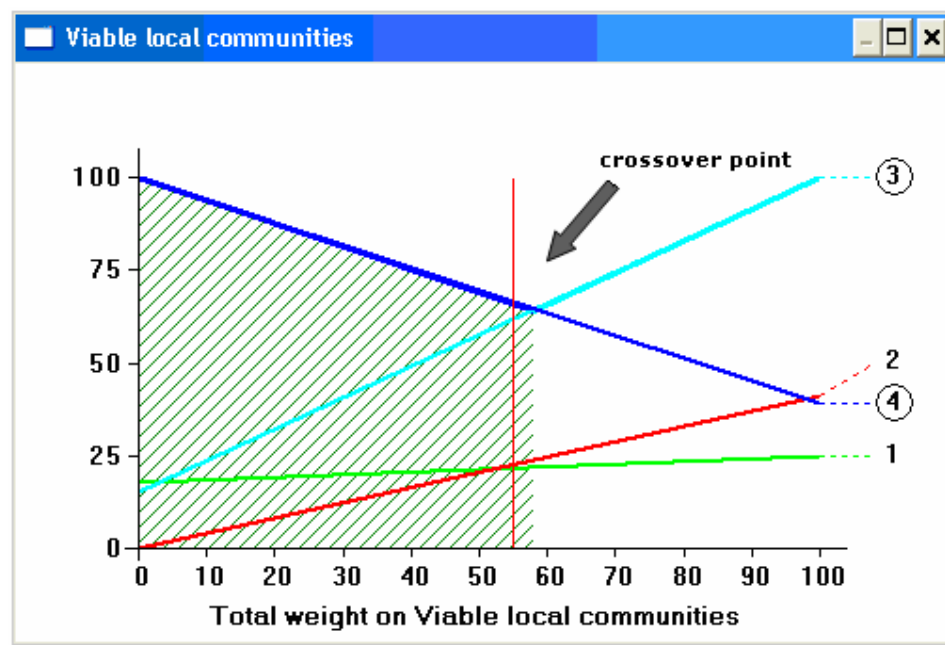


Figure 31. Total weight on ‘Viable local communities’ under all four options

However, a good decision is always based on the major trade offs and it is made obvious from the diagram (Figure 31) that in the current analysis this is not the case.

On the other hand, if the decision making group feels that the weight assigned on ‘Viable local communities’ should increase then it should choose option 3; similarly, if the

decision making group feels that less weight should be assigned on this objective, then option 4 should be preferred. All these changes in weights should be done with all other weights remaining in the same ratio.

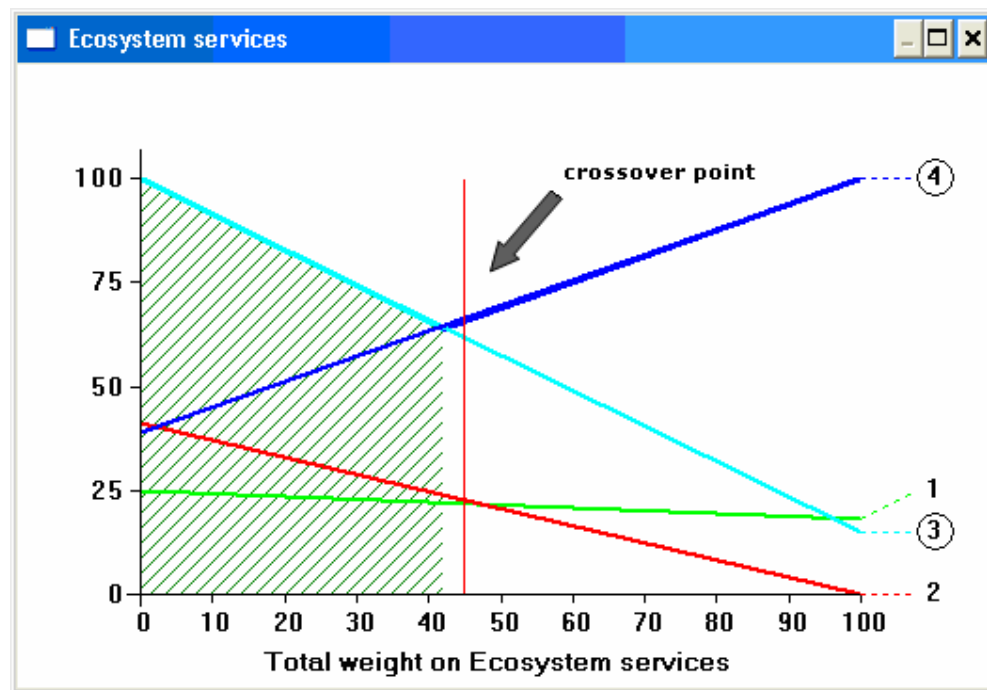


Figure 32. Total weight on 'Ecosystem services' under all four options

The converse diagram for 'Ecosystem services' (Figure 32) also depicts this clearly. If the decision group prefers to increase the weight on 'Ecosystem services' it should choose option 4, while, in the opposite case, it should choose option 3. This is also revealed by the interviews carried out.

Mr Duncan ('Marine Conservation Society') felt that the CMNP is an imperative need because it would provide a framework under which all management initiatives would be integrated. Moreover, he pointed out that apart from framework and planning, extra zonation through creating more areas about nationally important species is needed; he felt that the biggest threat for the coastal and marine environment of the area is poor management, while he added that designated areas such as SACs and SPAs are only

indicators of the importance of the area. Therefore, if, hypothetically speaking, Mr Duncan was a member of the decision group of the current analysis he would probably choose option 4. It could also be assumed that during the weighting process, Mr Duncan could possibly apply a greater weight (Table 23) on “Ecosystem services”. Therefore, in this hypothetical situation, results could be presented as shown below:

Objectives	Weights
Ecosystem services	70
Viable local communities	30

Table 23. A hypothetical weighting by an environmentalist

Mr Balmforth (‘British Marine Industries Federation’) felt that the designation of the CMNP would bring tighter planning controls such as inhibition of coastal infrastructure development. When asked whether protection measures are needed, he clearly stated that both marine planning already and zonation approaches already exist, as there are designated areas such as SACs, transportation routes and speed control regulations. Moreover, the positive changes produced by the CMNP were considered to be infrastructure development and creation of potential in terms of business’ increase. Finally, zonation, according to Mr Balmforth’s sayings would lead to monitoring cost, and, as a result, to taxation on fishermen. Consequently, this option would be met with huge opposition. On the whole, if Mr Balmforth was a member of the hypothetical decision group he could possible prioritize the objectives as shown below (Table 24):

Objectives	Weights
Ecosystem services	30
Viable local communities	70

Table 24. A hypothetical weighting by a person employed in the recreational sector

Ms Fairgrieve ('Scottish Coastal Forum') felt that the most important threats on the marine and coastal environment are climate change and overuse because of too many tourists visiting the place. Additionally, she stated that protection measures such as fishing restrictions are inevitable; however, these should be done in cooperation with the current fisheries management initiative; Inshore Fisheries Group. Raising awareness of the locals and avoiding preaching were considered to be crucial issues during this interview. Much emphasis was put on protecting what already exists and being proactive and prepared for inevitable changes. Therefore, in the hypothetical scenario under discussion, Ms Fairgrieve would put much emphasis on proactive procedures and on the integration of already existing management initiatives. It is difficult to make an assumption in terms of weighting procedures but it is believed that Ms Fairgrieve would probably assign a high weight on options which include proactive procedures.

Mr Stewart ('Clyde Fishermen Association') considered that there is no need for application of fishing restrictions as there is already a fairly well developed system of environmental protection under measures such as the Wildlife Countryside Act. Moreover, fishing restrictions would probably result in major conflicting bureaucracy, a fact that would make all procedures move slowly. Much emphasis was put on both sustainable development of communities and protection of the environment from uncontrolled development in terms of infrastructure. Overall, no specific tendency could be derived as far as weighting is concerned for the interviewee under discussion. However, it is worth mentioning that despite the fact that Mr Stewart does not think fishing restrictions are necessary -which is reasonable given his background and the stakeholder group he represents-, he still believes that environment should be protected from unsustainable development of infrastructure. This point, consequently, offers a potential of improvement in the MCDA. Further research should be done to include more criteria such as infrastructure development.

Finally, Ms McConnell (Argyll and Bute Council, Marine and Coastal Development Unit) said that fishing restrictions could be a possibility but this aspect requires further

clarification and work so that the best approach is found. Non-sustainable management, lack of integration and unregulated activities were considered to be the most important threats to the environment. Mr Stewart and Mr Duncan also agreed to the poor management of the area. Much emphasis was put on public bodies and local authority not losing power-related rights they already exercise.

The sensitivity analysis related to the data derived from the interviews, explored the uncertainty related to people's backgrounds. It revealed that people from different backgrounds would assign different weights on the identified options. If the five interviewees were members of the decision making group, many different and possibly opposite opinions would be stated. Nevertheless, this is reality and this where MCDA is valuable; being participatory and enhancing stakeholder involvement, the MCDA may lead to the development of consensus-based approaches. Moreover, it was made obvious that the sensitivity analysis could improve the model by including more criteria, thus, integrating more aspects and reducing uncertainties and assumptions.

After the sensitivity analysis, the balance of the options produced by the model is presented (Figure 33).

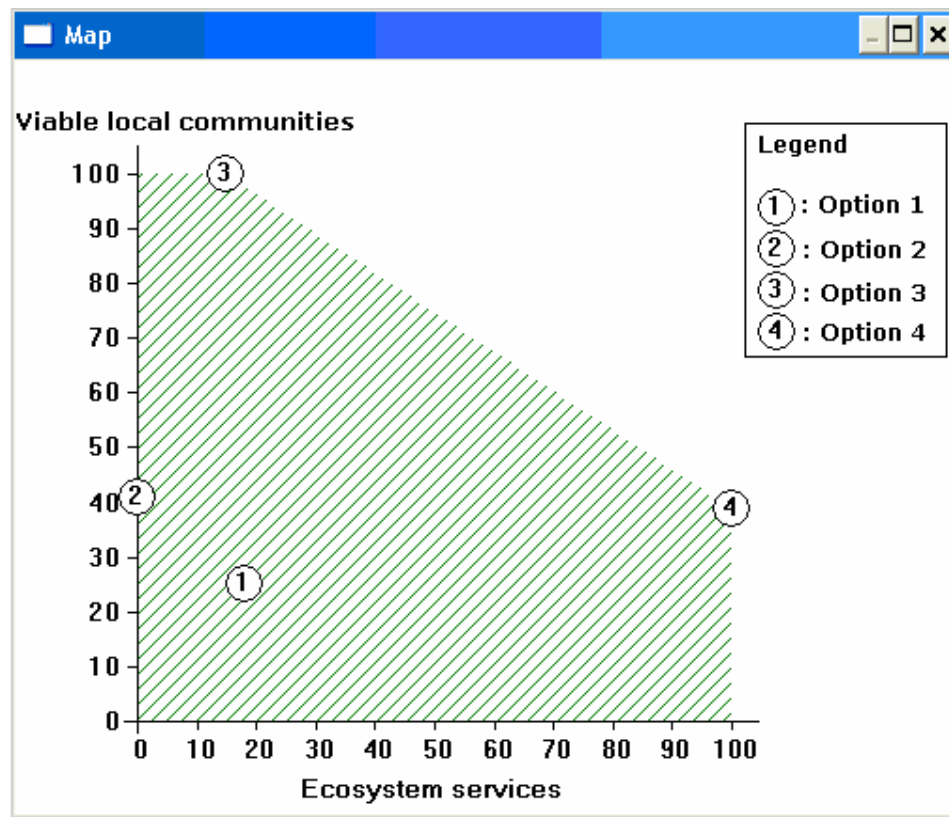


Figure 33. Balance of the options

Figure 33 shows the final performance of each of the options on the identified criteria. More specifically, option 3 performs well on 'Viable local communities', while option 4 performs well on 'Ecosystem services'. A good option should be situated on the top right hand corner of the diagram. Option 2 is performing really badly overall. The only option that seems to be well-balanced is option 1 (status quo); however, it is performing quite poorly on the criteria; therefore, it is not classified as a good option.

The main result of this initial exploration of the problem is that none of the options is suitable. Options which will improve the performance on the major criteria need to be found. This could be done if actions which will provide the benefits which are currently missing are added. For example, more ecosystem preservation actions could be added in option 3, while more local viability actions could be added in option 4. This is also shown in the following figure (Figure 34) where option 4 is compared against option 3.

Advantages in green colors (on the right hand side) are compared to disadvantages in red colors (on the left hand side) of option 4 against option 3.

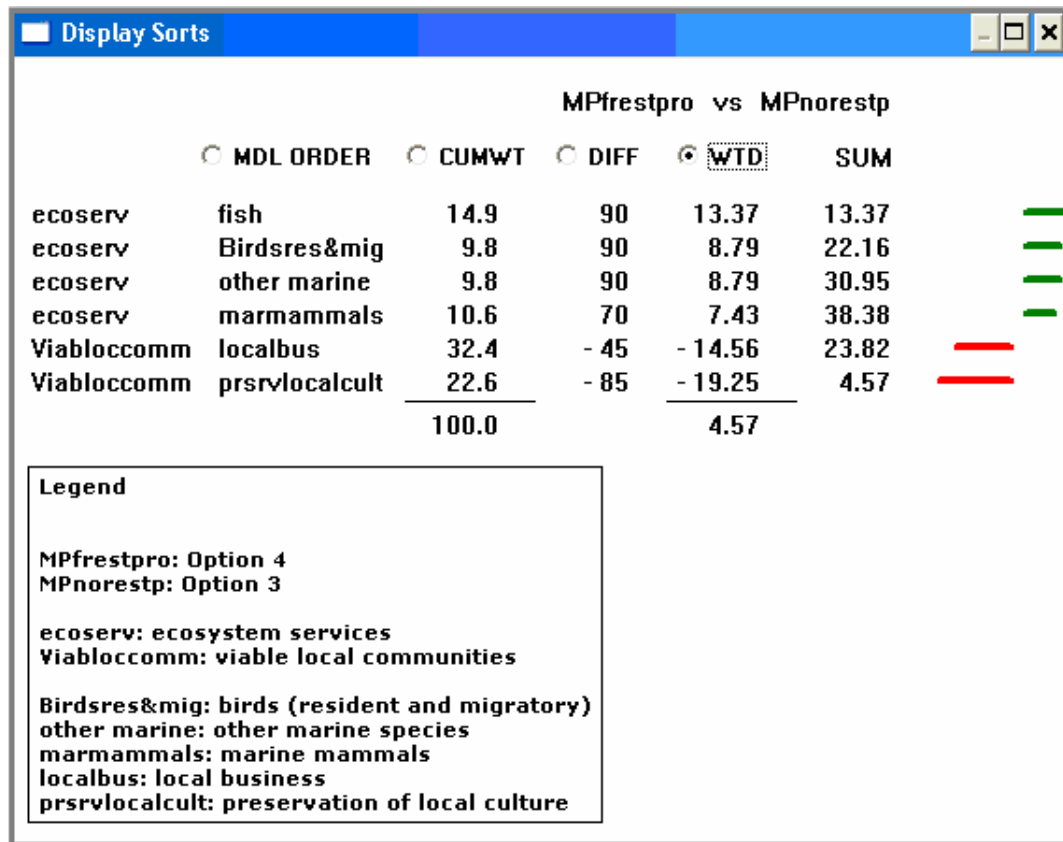


Figure 34. Comparison of option 4 against option 3

8 Discussion

To start with, the short amount of time available for the current study (3-4 months) implies that the assessment had to be largely based on already existing data and information. However, there were many problems related to finding relevant data for the case study area. The data mainly found involved larger areas, such as the west coast of Scotland or the whole of Scotland; areas that were referred in their old names such as 'Old Argyll' which made it quite difficult to define the area's actual boundaries when compared to the case study area; or even areas divided in traditional ways such as creeks. As a result, in order for the best data to be found, data were collected throughout the whole time of carrying out this thesis; which is not appropriate. In a real life situation, this is usually not possible. It is worth mentioning that most of the important data sources were detected after either personal communication with people or suggestions of the supervisors. Therefore, there is an imperative need for an integrated information network which would make all existing data available. When there is data limitation and time constraint, this poses impediments on the research and has consequences for the accuracy and reliability of the outcomes of the study. This happens because more assumptions and uncertainties have to be included in the model, making, thus, the results more sensitive. However, in a real life situation during an MCDA process there are usually more than one researchers collecting data and working on the report.

Apart from the data-related uncertainties there are other uncertainties about the results; climate change and its associated consequences. Global average temperature is projected to rise under all IPCC (Intergovernmental Panel on Climate Change) SRES (Special Reports on Emission Scenarios) scenarios. Additionally, global mean sea level is projected to rise by 0.09 to 0.88 meters between 1990 and 2100 again for the full range of SRES scenarios (IPCC, 2001). This is the reason why the current thesis is a short-term (next 10 years) approach, as, for longer-term accountability other factors should also be considered.

Another issue that needs to be addressed in this section is that the carrying out of interviews was a crucial part of this thesis. First of all, they deepened the author's knowledge and understanding of the case study area. Furthermore, it was quite interesting to analyze how each of the interviewees responded to the same questions according to his background. The interest is based on the fact that, in real life situation, a decision group may be comprised of people from the same backgrounds as the interviewees. Attending a meeting of this group and exploring the possible trade-offs and negotiations would be quite challenging.

Additionally, it is also important to clarify that, normally, stakeholder participation is included in the MCDA and stakeholders might even be part of the decision making group and be asked to assign scores and weights; due to time constraints, this thesis is an illustrative example and does not involve local participation.

Finally, it could be argued that the author's background was ideal for this research as she does not belong in any stakeholder groups or administrative bodies. Therefore, the bias included in the study was the least possible.

9 Conclusion

This study has been concerned with the assessment of Argyll Islands and Coast for national park designation purpose. Qualitative and quantitative data were combined to produce better results and reduce uncertainties.

Overall, this study has been a quite interesting and enlightening experience. In my opinion, this approach is applicable to other similar situations; that is to say that marine or simply remote communities have a specific way of apprehending things. Given the fact that they are away from big city centers they have developed their own ways of coping with problems and difficulties which arise from the former. Moreover, usually remote communities have a strong culture and identity and feel more connected to their land, sea and environment in general. Marine communities have similar characteristics all around the world; therefore this could be considered a starting point, something like a pilot study, for implementation in other areas as well. As far as the outcomes of this thesis are concerned, I believe that more detailed options are needed and more criteria to assess the area. It is worth noticing though, that the point of the MCDA is to provide the decision-making group with the results according to the data introduced. From this point forward, the option which should be chosen depends on the priorities set by the group. This is also shown by the outcomes of the current thesis which satisfied me and all of the working team.

10 Acknowledgments

Firstly, I wish to thank my supervisors, Dr. Graham Russell and Dr. Katie Begg, for their continuous assistance and guidance throughout the carrying out of this thesis. Their useful advice and suggestions broadened my horizons and improved the content of this study. Moreover, I would like to thank the five interviewees who were happy to spend some of their personal time to help me with my work and share their opinions with me; more specifically, I would like to thank Mike Balmforth, Rhona Fairgrieve, Shona McConnell, Patrick Stewart and Calum Duncan. Furthermore, I extend my thanks to some people, who facilitated my data research during the past four months; in particular, I would like to thank: Heather Holmes (Scottish Executive), Ronald Smith (Fisheries Research Services), Judith White (Scottish Executive) and Ken Hughes (Scottish Salmon Producers' Organisation). Last but not least, I thank my family and all my friends who encouraged me and offered me support from the beginning to the end of this thesis. I thank them for being there for me whenever I felt like grumbling, talking, asking for advice or simply needing a hug.

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Appendix 1.

Sites of Specific Scientific Interest in Argyll Islands and Coast

Site name	Area (ha)	Date last notified
Strone Point, North Loch Fyne	4	1984
Taynish Woods	390	1988
Moine Mhor	1195	1987
Jura		
Kinuachdrach	143	1992
Doire Dhonn, Jura	41	1990
Craighouse Ravine, Jura	3	1986
West Coast of Jura	1876	1985
Islay		
Rubha A' Mhail to Uamhannan Donna Coast	418	1990
Ardmore, Kildalton & Callumkill Woodlands	1589	1991
Eilean na Muice Duibhe	574	1992
Laggan Peninsula	1270	1989
Bridgend Flats	331	1983
Rinns of Islay	331	1983
Glac na Criche	265	1985
Feur Lochain	384	1985
Gruinart Flats	3170	1985
Colonsay and Oronsay		
North Colonsay	800	1983
Loch Fada	87	1985
West Colonsay Seabird Cliffs	49	1984
Orosnsay	329	1983
Argyll and Bute		
Garvellachs	265	1985
South Kerrera & Gallanach	83	1986
Ard Trilleachan	606	1983
Bonawe-Cadderlie	892	1984
Kennacraig & Esragan Burn	168	1984
Lynn of Lorn Small Islands	98	1984
South Shian & Balure	9	1988
Glasdrum	448	1986
Clach Tholl	8	1984
Lismore Lochs	111	1992
Bernera Island	44	1990
Staffa	45	1986
Treshnish Isles	208	1988
Tiree		
An Fhaodhail & The Reef	319	1986
Ceann a'Mhara	34	1984
Hough Bay & Balevullin Machair	508	1989
Coll		
North East Coll Lochs and Moors	2301	1984
Totamore Dunes	128	1986
Crossapol & Gunna	973	1989

Appendix 2.

Questionnaire and Interviews

Questionnaire

1. What is, in your opinion, the most economically important activity/ activities in the “Argyll Islands and the Coast” area? Why? Explain.
2. What is, in your opinion, the most important threat for the coastal and marine environment of this area?
3. What changes do you believe that the designation of the Coastal and Marine National Park will have in the area?
4. Why do you think this area might be suitable for designation of a Coastal and Marine National Park?
5. How could a Coastal and Marine National Park help communities develop in a more sustainable way?
6. Do you think protection measures (zonation, spatial and/or temporal restriction, etc..) for the CMNP are needed? Yes/ No? What kind of measures?
7. Do you think fisheries should be managed in the designated area? How?
8. What do you think will happen if, as a result of the designation of the CMNP, visitors double in the area?
9. What do you think should be the function of the Park Authority?
10. Should the locals be involved in the Park management? Why? How?

Questions	Interviews				
	Mike Balmforth (BMIF)	Rhona Fairgrieve (SCF)	Shona McConnell (LA)	Patrick Stewart (CFA)	Calum Duncan (MCS)
Q1	tourism (all kinds of it)	tourism (sailing, associated services, aquaculture facilities, fish farming)	all activities equally important (eg, agriculture, aquaculture); this area can only exist if all these activities are well managed and allowed to have economical opportunities	primary producing activities and tourism	tourism (all kinds); secondary activities: aquaculture, fisheries
Q2	1. infrastructure development 2. renewables' energy development (especially tidal barrages) 3. windfarms 4. aquaculture activities 5. scallop dredging and trawling	1. climate change and associated implications (increased storminess, arrival of alien species) 2. overuse (because of too many visitors)	-non-sustainable management; lack of integration, legislation, unregulated activities, lack of awareness by locals -it's highly unlikely that new activities such as offshore windfarms and marine renewables cause problems unless they are sustainably managed	uncontrolled development in terms of infrastructure	poor management; for example, aquaculture in Scotland is better managed because it is better regulated there should be a proper accountable forward planning system in place

Q3	<p>a. beneficial changes</p> <ul style="list-style-type: none"> - investment in infrastructure (ferry links and roads, businesses) - greater interest to people because of publicity - potential development change in terms of businesses' increase <p>b. detrimental changes</p> <ul style="list-style-type: none"> - tighter planning controls → inhibition of coastal infrastructure development - increase in businesses → problems of staff, personnel, no proper training, imbalance between economic development and resources 	<p>offshore elements of the CMNP: sort of formalised structure, framework</p>	<p>difficult to say because the consultation did not specify a final model for the Park</p> <p>Negative:</p> <p>if the model of the Park decided that the Park Authority would take powers and function currently delivered by the Council</p>	<p>advantages: some sort of planning (but this is already done by local authorities), so another authority on the top of that → vandalism</p> <p>disadvantages: major conflicting bureaucracy → cause problems, problems in fisheries industry due to prohibitions</p>	<p>advantages:</p> <ul style="list-style-type: none"> -more money for rural areas both directly from government and through product marketing → bring opportunities to produce added-value produce -good investment to the area → improvement of infrastructure facilities -a strong local voice in decision-making and a more 'joined-up' planning system through the CMNP Plan → one better management -local responsibility and greater care for the special qualities of the area -more local, long-term employment <p>disadvantages</p> <ul style="list-style-type: none"> -honey-pot effect -infrastructure, development pressures
Q4	<p>NOT THINK there should be a CMNP because → problems to businesses both in terms of labour and housing</p> <p>But to the point:</p> <ol style="list-style-type: none"> 1. unique biodiversity 2. diving tourism (shipwrecks) 	<p>NOT THINK it was one of the strongest candidates; instead: Solway of Firth (amazing estuary, recreation activities, cultural heritage) because Argyll Islands and the Coast</p>	<ol style="list-style-type: none"> 1. the area meets the criteria as set out by Ministers in the consultation document 2. the area is contained within existing local boundaries and would not involve boundary overlaps 3. the area is easier to manage 	<p>NOT THINK it would be suitable</p> <p>-there should have ONE system with the highest standards for the whole of the Scottish coast</p>	<ul style="list-style-type: none"> -marine biodiversity richness -natural and cultural heritage; wrecks most of which are ancient and need protection -valuable landscape -activities such as diving, marine wildlife watching -increased numbers of

		gets lots of tourism anyway	and therefore easier to work to deliver benefits at a local level	-if there was it to be a system of Marine Spatial Planning, which the CMP implied, then it should be overall Scotland's waters	tourists SACs, SPAs are only indicators of the importance of an area-> need for overall management
Q5	Under the conditions that: 1. A more bottom-up approach was used 2. Representatives were elected (more democratic way) 3. If it was to simplify and coordinate marine planning consent and licensing	1. Establishment of a long-term strategy framework 2. Raising awareness to the locals (NOT PREACHING) 3. Encouragement of good environmental practice – assistance to help communities become sustainable	- increase in local involvement in community action - safeguard and enhancement of cultural heritage - improvement of transport network -increase in employment related to natural and cultural resource-based activities - increase in level and range of environmental skills of locals - increase in partnership and support mechanisms→ build capacity & empower local communities - greater integration between activities → proper management for the future as well - greater decision-making at a local level	- communities have to develop which they don't; they are declining -matter of prevention: prevent people develop things which would be unsustainable in the environment -cannot see how the CMNP was going to make it any better	-opportunities for sustainable projects -a planning system that would prevent inappropriate development -opportunities for added-value produce -bring greater awareness and recognition of what is actually there -greater local ownership and stewardship, the biggest thing -if they felt proud about it they would want it to be properly managed-

Q6	<p>No; marine planning organization exists wherever needed. There are already protection measures such as SACs, transportation routes and speed control regulations.</p>	<p>Yes; it's inevitable. But: need to take into consideration all current uses and the fact that some areas will lend themselves more naturally to certain uses than others</p>	<p>Yes, under the conditions that</p> <ul style="list-style-type: none"> - zoning not relates to land use areas - these measures serve the aims of all the Park Plan, other regulators, such as IFG, and the local authorities 	<p>- protection against what?</p> <ul style="list-style-type: none"> - there is a fairly well developed system of protection under Wildlife Countryside Act and other measures, including European measures 	<ul style="list-style-type: none"> -there is already zonation in place, fisheries plans, SACs; however, more zonation is needed to protect marine life -the CMNP Authority would have a framework under which all activities and management-zonation activities should be integrated
Q7	<p>There should be a management approach everywhere in terms of</p> <ol style="list-style-type: none"> 1. the protection of the environment 2. the sustainability of fisheries resources (for their own good) <p>But</p> <p>If zoning, regulation → monitoring costs → taxation on fishermen → huge opposition</p> <p>What is proposed is already done; fishermen respect the rules</p>	<p>Again yes; it's inevitable. However, it's a huge challenge. This is one of the reason that the idea of the CMNP has not been welcomed with open arms</p> <p>But: many management initiatives for UK fisheries: another management initiative is not such a good idea</p>	<p>Positive but this aspect requires clarification and further work carried out to determine the best approach for managing fisheries within the Park's area</p> <p>Fisheries are already managed by the Inshore Fisheries Group (IFG)</p>	<p>They should be managed but not by the Park Authority</p>	<ul style="list-style-type: none"> -not a fisheries expert -they should be manages as it should happen anywhere -management by the IFG but taking into account CMNP's Plan as well

Q8	<p>Chaos!</p> <p>Unsustainable in terms of infrastructure, business resources (boatyards and marinas), staffing</p>	<p>Not convinced that this could happen unless there were specific facilities provided but there has to be a realistic assessment of coastal management: you cannot protect everything all the time; when trying to balance environmental, economic and social aspects, there has to be a compromise</p>	<p>It's unlikely but in case it did happen → pressure on both transport (road networks, ferry services) and accommodation infrastructure (hotels, bed & breakfast 's)</p>	<p>-first: need to deal with raising standards: because low tourist numbers → very low standards of looking after them</p> <p>-so, after I think raising these standards dramatically, then talk about how you would deal with about twice as many tourists</p> <p>-In Campbeltown: twice as many visitors not make much of an impact on the environment, if they were practising low intensity activities (e.g., walking, sailing)</p>	<p>-there is the potential of pressures in some areas; more traffic jams; pressure in infrastructure; more competition between activities</p>
Q9	<p>1. to simplify and integrate existing functions rather than producing another piece of bureaucracy</p> <p>2. to identify areas that need to be sustainably developed</p> <p>3. to have a principle of less government;</p> <p>“Less is more”</p> <p>“Less is the new more”</p>	<p>1. to protect what already exists on the whole (natural resources, way of life, cultural heritage)</p> <p>2. to be proactive and also recognize that changes are inevitable</p> <p>3. be aware of the unique environment of which it operates</p>	<p>- Model of the Park be the planner, enabler and manager; to plan, integrate and coordinate the efforts of others, resolve conflicts and facilitate the implementation of the initiatives and projects on the ground</p> <p>- NOT BEEN GIVEN responsibility for functions already exercised by public bodies or the local authority</p>	<p>-as low as possible because there is no need for more authorities and bureaucracy</p>	<p>-it should produce a strong Park Plan that is a clear route for meeting the Park aims</p> <p>-it should have responsibility for access, full planning powers on land and a lead role in planning and coordinating activities at sea</p> <p>-introduce measures to ensure that the natural heritage of the Park is conserved and enhanced</p> <p>-it should introduce an action</p>

					plan for involving local and national interests in the management of the Park
Q10	Of course! In an economic way, with development grants→ better planning system/ policy	Certainly! With local engagement opposition problems are overcome as locals have some sort of sensible ownership in decisions	It is imperative that there is a strong integrated working relationship between the relevant local authority and the Park Authority to ensure joined up governance, minimise confusion and delay	All of the stakeholders should! (For example, fishermen from Northern Ireland wouldn't be taken into consideration while they should –given the fact that they have an economic interest in the area)	Yes, they should! In order for them to have a sense of ownership and stewardship; they need to be part of the process; it is important that they are included and have been accounted for in the development of the CMNP Plan and subsequently of the implementation of the Plan

IFG: Inshore Fisheries Groups

BMIF: British Marine Industries Federation

SCF: Scottish Coastal Forum


LA: Local Authorities

CFA: Clyde Fishermen Association

MSC: Marine Conservation Society

Appendix 3.

Preliminary Ethics Assessment Form

INSTITUTE OF GEOGRAPHY RESEARCH ETHICS COMMITTEE	
PRELIMINARY ETHICS SELF-ASSESSMENT FORM	

This Preliminary Ethics Self-Assessment is to be conducted by the investigator. For undergraduate students this audit will be undertaken in Research Techniques and scrutinised by the Prospective First Supervisor, along with the Research Proposal and the Health and Safety Assessment. For Masters Students this form will be reviewed by the Programme Directors and Supervisor. Please complete this form in conjunction with the Guidelines provided at <http://www.geos.ed.ac.uk/geography/Ethics>.

Title of Project Construction and implementation of the Multi-Criteria Analysis model to one of the ten strongest candidate areas for Scotland's first Coastal and Marine National Park

Principal Investigator/Supervisor, and any Co-Investigator(s): Dr Graham Russell, Dr Katherine Begg
(Honours Students please leave blank)

Student Name (if applicable): Christina Garoufalia

Type of student:	PhD <input type="checkbox"/>	Masters by Research <input type="checkbox"/>	
	Taught Masters <input checked="" type="checkbox"/>	Honours <input type="checkbox"/>	

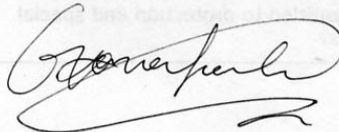
Overall assessment (to be completed after the questions below have been considered)

SELF AUDIT HAS BEEN CONDUCTED

YES ☒ NO ☐

If any risks are identified, Full Ethics Assessment is required

Signature of applicant:



Date: June 2007

Marker confirms that there **ARE** foreseeable ethical risks
(Supervisor or Course Organiser or Programme Director)

Date:ccc

YES ☐

If YES, further consultation with Supervisor is required

Protection of research subject confidentiality

Is confidentiality adequately handled by normal tenets of ethical academic research?

YES ☒ NO ☐

If NO, Full Ethics Review required

For example, are there mutually understood agreements about:

non-attribution of individual responses;

individuals and organisations being anonymised in publications and presentation, if requested;

feedback to collaborators, rights to edit responses, intellectual property rights and publication?

Potential physical or psychological harm, discomfort or stress

Is there significant foreseeable potential for psychological harm or stress for those involved in your research?

YES ☐ NO ☒

Is there significant foreseeable potential for physical harm or discomfort for those involved in your research?

YES ☐ NO ☒

Is there significant foreseeable risk to the researcher?

YES ☐ NO ☒

If YES, Full Ethics Review required

Moral issues and Researcher/Institutional Conflicts of Interest

Do any special moral issues / conflicts of interest arise?

YES ☐ NO ☒

If YES, Full Ethics Review required

For example:

might the researcher be compromising research objectivity or independence in return for financial or non-financial benefit for him/herself or for a relative or friend?

are there particular moral issues or concerns that may arise, for example where the purposes of research are concealed, where respondents are unable to provide informed consent or where research findings impinge negatively/ differentially upon the interests of participants?

does your research involve vulnerable persons such as children, institutionalised persons or others entitled to protection and special procedures to protect their interests?

Data protection and consent

Are issues of data handling and consent dealt with adequately and following procedures?

YES ☒ NO ☐

If NO, Full Ethics Review required

For example:

will personal data be collected about respondents without their consent?

are there special issues about confidentiality/informed consent in this case?

is research compliant with UoE DP procedures
(See www.recordsmanagement.ed.ac.uk)?